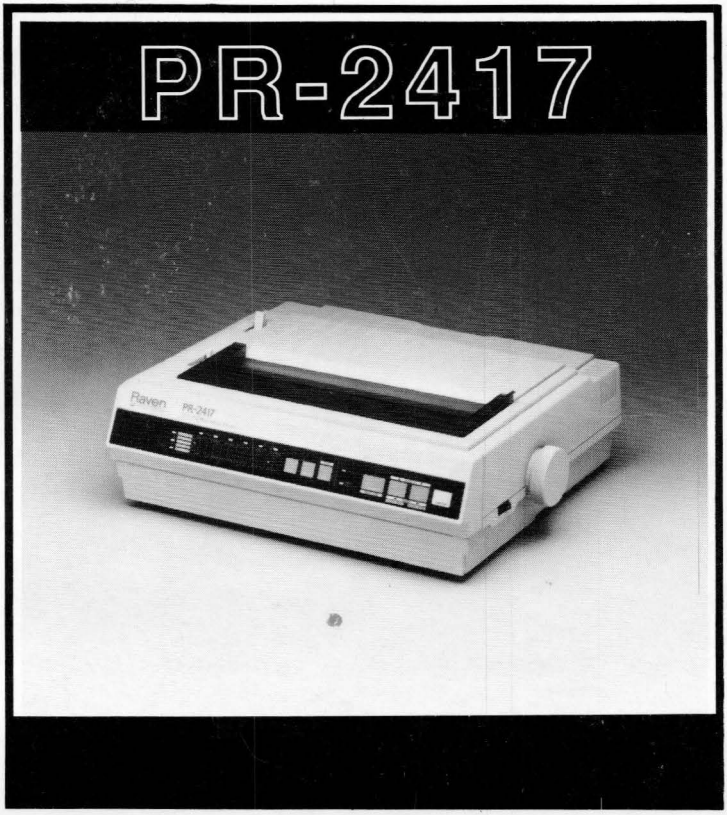
Operating Instructions

Impact Dot Matrix Printer



Raven

Roland DIGITAL GROUP

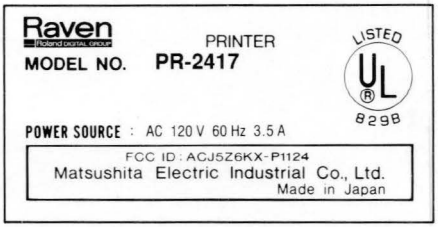
Before operating this unit, please read these instructions completely.

FOR USERS IN UNITED STATES ONLY

This equipment has been tested and found to comply with the limits for a Class B computing device in accordance with the specifications set forth in Subpart J of Part 15 of FCC Rules. If this equipment does cause interference to radio or television reception which can be determined by turning the equipment on and off, use the equipment in another location and/or utilize and electrical outlet from that used by receiver. The user should use special accessories, such as shielded cable, as recommended in these operating instructions, in order to continue to meet FCC emission limits and not possibly interfere with nearby radio and television reception.

The equipment should FCC ID No. on the nameplate.

Nameplate



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MAILING LABEL CAUTION

When printing adhesive mailing labels, do not back up the tractor feed, either manually or through software. Reversing the tractor can cause a label to detach and adhere to the paper guide, requiring dismantling of the printer to correct. This problem is not covered by warranty.

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Any details given in these Operating Instructions are subject to change

FOR USE IN AUSTRALIA

FOR YOUR SAFETY

To ensure safe operation the three-pin plug supplied must be inserted only into a standard three-pin power point which is effectively earthed through the normal household wiring.

Extension cords used with the equipment must be three-core and be correctly wired to provide connection to earth. Wrongly wired extension cords are a major cause of fatalities.

The fact that the equipment operates satisfactorily does not imply that the power point is earthed and that the installation is completely safe. For your safety, if in any doubt about the effective earthing of the power point, consult a qualified electrician.

WARNING

- Power source voltage of this unit is listed on the nameplate. Do not fail to plug into the right voltage.
- To prevent fire or shock hazard, do not expose this product to rain or any type of moisture.

The serial number of the unit may be found on the label on the rear of the unit. For your convenience, note this number below, and retain this book, along with your proof of purchase, to serve as a permanent record of your purchase in the event of a theft, or for future reference.

MODEL NO. **PR-2417** NAME OF DEALER _____

SERIAL NO. _____ DATE OF PURCHASE _____

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OPTIONS and SUPPLIES

1. Introduction

1.1 Product Overview

This printer is a durable, highly reliable dot matrix printer. In addition, it has a small footprint, making it ideal for a compact workstation.

This printer uses a 24 pin print head to form a 24×9 dot matrix character in draft mode. In letter quality mode, the matrix is 24×30. Available are the complete Epson and IBM character sets as well as 13 international character sets.

In addition to Pica (10 characters per inch) and Elite (12 characters per inch) printing, this printer can print in Micron mode of 15 characters per inch, Compressed mode of 17 characters per inch and Elite compressed mode of 20 characters per inch. Elite compressed mode yields a total of 160 characters per line.

In addition to the five print pitches mentioned above, this printer has proportional spacing thus, six basic printing pitches are available.

The printer has an EZ Set Operator Panel through which the user can select the most commonly used features and functions. The printer also has the MACRO memory function. This feature allows the printer to easily save and recall a particular combinations of functions, even if the power is turned off. Another of the printer's helpful features is the QUIET mode which reduces printing noise.

As convenience features, the printer has MEMO LOAD, PERFORATION CUT, and MICRO LINE FEED features. By using MEMO LOAD, you can print a single sheet or envelope without removing or wasting the continuous fanfold paper. PERFORATION CUT gives you the ability to tear off a form without wasting paper and still print within 1/3″ of the top of the paper. By using MICRO LINE FEED you can easily feed the paper to the exact printing position needed for preprinted forms. Section 3 in this manual explains these functions.

The high speed printing is done at 192 characters per second (cps) in Draft-Elite pitch. In Draft-Pica pitch, the printing speed is 160 cps. Processing speed is increased by bidirectional printing. That is, the printer prints right-to-left as well as in the normal left-to-right manner. A logic seeking technique is also used, giving the printer a look-ahead capability which allows it to skip blank spaces at the beginning and end of a line and the blank lines.

A wide variety of printing styles allows the user to create unique documents and drawings. By combining fonts, pitches and enhancement modes such as double height, double width, underline, etc., you can create more than 5,500 different print styles. Using bit-mapped graphics, the printer can produce special effects ranging from company logos to photo-like images.

User adjustable Pull/Push type tractor feed and friction feed are both standard on this printer. This allows the printer to accommodate both continuous fanfold and single sheet paper as well as envelopes, and is very useful when printing on non-standard paper sizes such as mailing labels. In "push" tractor mode, continuous forms can be torn without the need to skip a form when advancing to the next one. In "pull" tractor mode, continuous fanfold paper can be fed from beneath or from in front of the printer.

The print head life is designed for 100 million characters. The seamless fabric ribbon has an operating life of three million characters. The ribbon cassette design makes changing the ribbon easy and clean.

This printer comes with a Centronics parallel interface. An RS-232C serial interface is available as an option. This interface supports the XON/XOFF and DTR handshaking protocols at baud rates up to 19,200 bps.

The printer comes equipped with an internal 6K buffer. An additional 32K buffer is available as an option which expands the total buffer size to 38K. The entire buffer area can be used as a receiving buffer or a portion can be used as a download font area. The buffer area assignment is selected by EZ Set Operator panel operation.

For software compatibility, this printer has two command sets: Epson LQ-2500 and IBM proprinter X24. Either set can be selected from the EZ-Set Operator panel. Refer to Section 3.3 in this manual.

- Epson FX-86e/FX-800
- IBM Proprinter II*
- **Panasonic KXP 1180**

1.2 Specifications

Power requirements: Frequency: Current:	Refer to the nameplate located on the rear of the printer
Interface:	Centronics parallel, RS-232C serial (option)
Print fonts:	Draft (Pica and Elite) Letter Quality (Courier, Prestige, Bold PS, Script, Sans Serif)
Software emulation:	Epson LQ-2500, IBM Proprinter X24
Character sets:	96 ASCII characters, 96 Italic ASCII characters, 32 International characters-13 countries, 32 Italic International characters-13 countries, 158 IBM special characters-sets 1 & 2
Dot configuration:	1/127 inch (0.2 mm) dot diameter

	Draft (Pica)	LQ
Dot alignment (Ver.×Hor.)	24×9	24×30
Dot pitch (Hor.)	1/120″ (0.21 mm)	1/360″ (0.07 mm)
(Ver.)	1/180″ (0.14 mm)	1/180″ (0.14 mm)

Maximum number of characters per line (cpl):		
	Pica [10 characters per inch (cpi)]	80 cpl
	Elite (12 cpi)	96 cpl
	Micron (15 cpi)	120 cpl
	Compressed (17 cpi)	137 cpl
	Elite compressed (20 cpi)	160 cpl
	Pica elongated (5 cpi)	40 cpl
	Elite elongated (6 cpi)	48 cpl
	Micron elongated (7.5 cpi)	60 cpl
	Compressed elongated (8.5 cpi)	68 cpl
	Elite compressed elongated (10 cpi)	80 cpl

Printing speed [characters per second (cps)]:	Draft-Elite	192 cps
	Draft-Pica	160 cps
	LQ-Elite	63 cps
	LQ-Pica	53 cps

Printing direction: Text printing: Bidirectional
Bit Image printing: Unidirectional
(user can select bidirectional)

Line feed time: Approx. 100 msec [with 1/6 inch (4.2 mm) line feeding]

Paper feed: Pull/Push (user selectable)-Tractor feed (with continuous fanfold paper)
Friction feed (with single sheet or envelopes)

Paper used:
Continuous fanfold paper:
Width: 4~10 inches (102~254 mm)
Thickness (paper weight in lbs/gms. per square meter):
in pull mode: 14~22/53~83
in push mode: 16~24/61~90
Single sheet:
Width: 4~11.7 inches (102~297 mm)
Height: 5~14.3 inches (127~363 mm)
Thickness: 14~24 lbs/53~90 gms. per square meter
Envelopes: Standard business envelope
ie: #10 size
(Refer to Appendix E.)

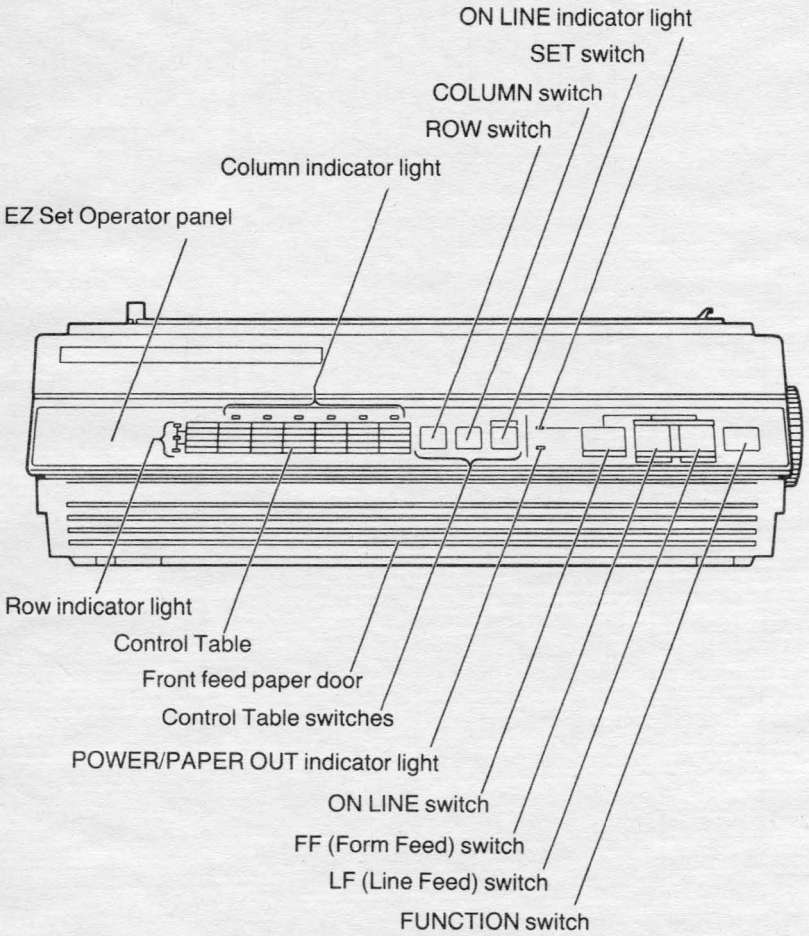
Copies: Original and 3 non carbon copies

Paper thickness: Total thickness of sheets must be less than 0.013 inch (0.32 mm)

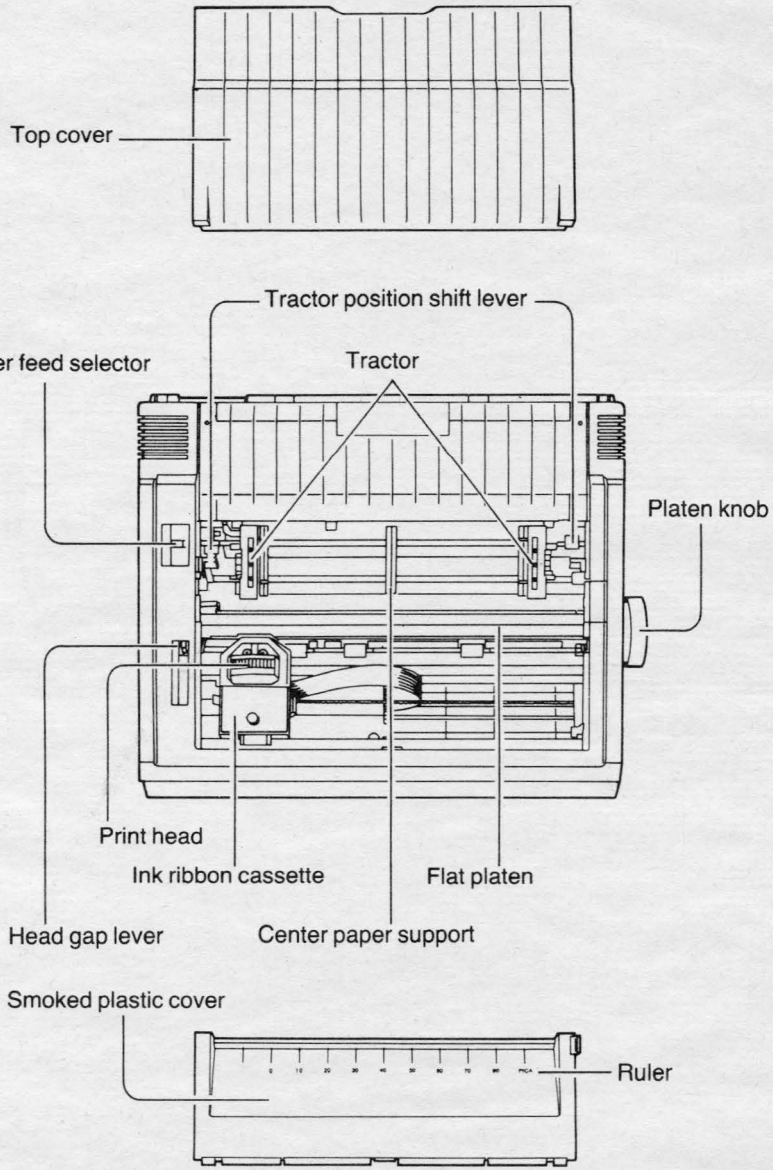
Operating environment:	50°F (10°C) to 95°F (35°C) temperature, 30~80% humidity (Please allow the printer to stabilize at room temperature within the operating temperature range before operation)
Storage environment:	−4°F (−20°C) to 140°F (60°C) temperature, 10~90% humidity
Head Life:	Approximately 100 million characters in draft mode
Ribbon:	Cassette seamless fabric ribbon Ink color: Black Life: Approx. 3 million characters in draft mode
Dimensions:	16.9 (W)×14.1 (D)×5.6 (H) in. (430×359×143 mm)
Weight:	Approx. 18.7 lbs. (8.5 kg)

1.3 Names of the Parts

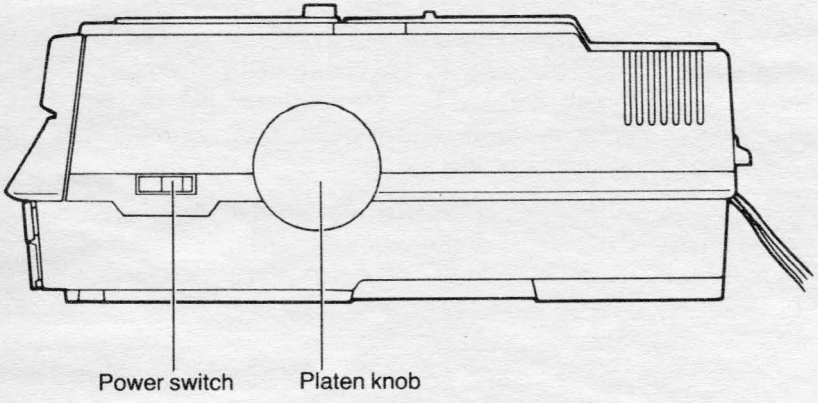
The Front View of the PR-2417



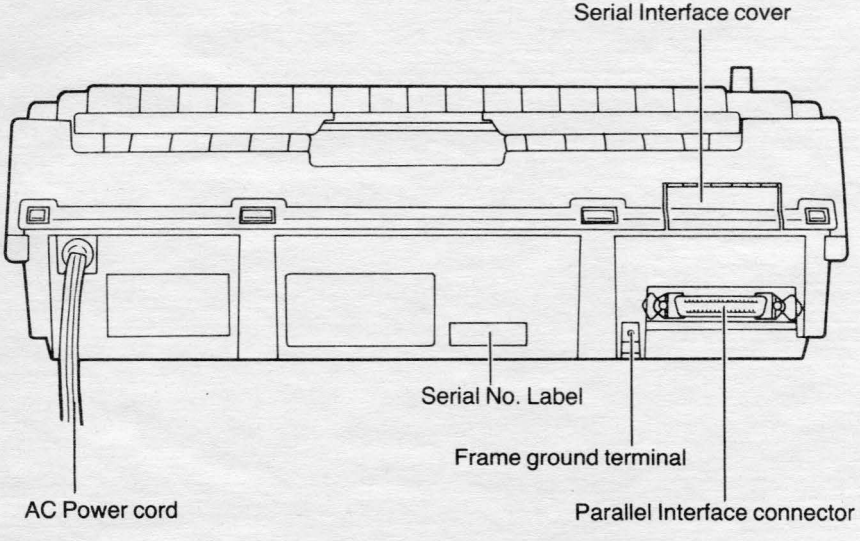
The Top View of the PR-2417



The Right View of the PR-2417



The Rear View of the PR-2417



2. Set up

2.1 Site Requirements

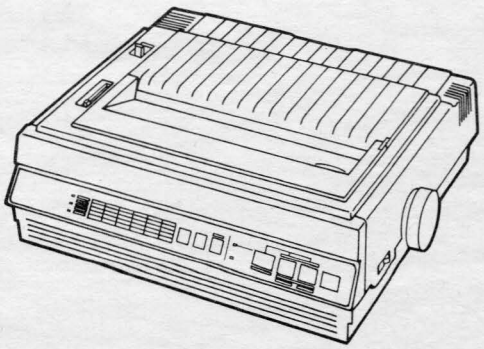
This printer can be installed in any normal office environment. No special wiring or cooling is required. However, a minimum of 4″ (10 cm) clearance on all sides is necessary to insure proper ventilation. The printer should be placed on a flat horizontal surface away from a heater or other heat source. The printer should not be used in an excessively humid or dusty environment. The following lists the operating requirements of the printer.

Line Voltage: Frequency:	} Refer to the nameplate located on the rear of the printer.
Temperature:	50~95°F (10~35°C)
Humidity:	30~80%

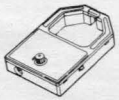
2.2 Unpacking and Inspection

Having opened the shipping carton, carefully remove its contents. Inspect the printer and accessories for damage. Report damage or shortages to the store from which the unit was purchased. You may have already seen the area inside the manual's front cover where you should record important information regarding the printer.

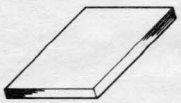
Please keep all the packing materials so that they may be used should you wish to transport the printer in the future. They are specifically designed to protect your printer during shipment.



Printer (PR-2417)



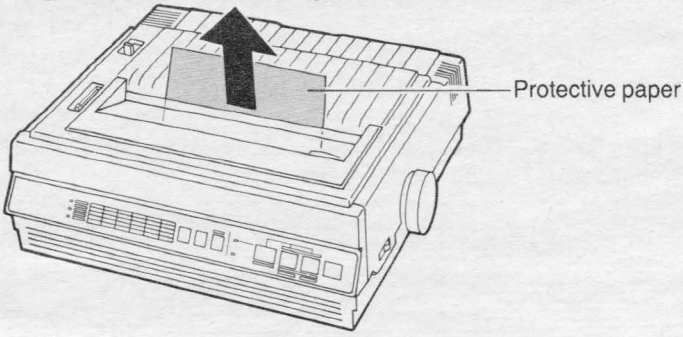
Ink ribbon cassette KXP-145



Operating manual

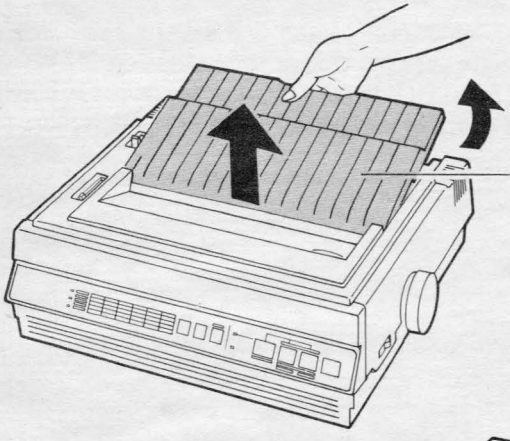
2.3 Initial Setup

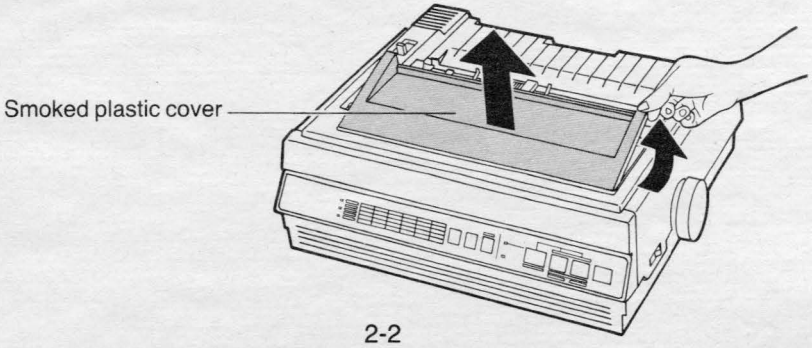
Removing the Protective Paper



Removing the Printer Covers

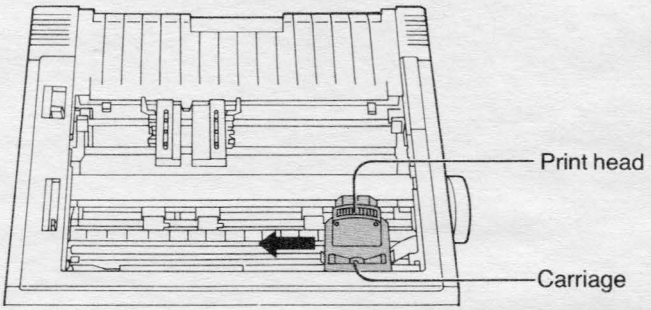
To remove the top cover and the smoked plastic cover, lift them in the directions as shown.





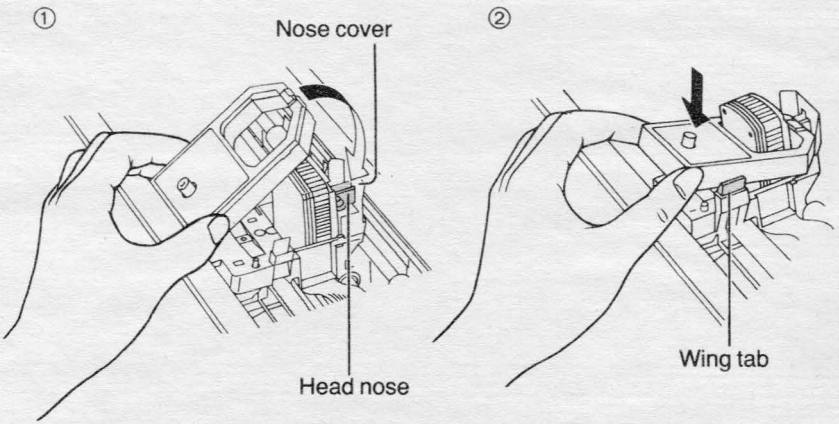
Mounting the Ribbon Cassette

(1) **Make sure the printer is off.** Gently slide the print head carriage toward the center of the unit.



(2) Prior to installing the cassette, remove any slack in the ribbon by rotating the knob on the cassette counterclockwise.

(3) Position the cassette over the print head and lower it in place as shown ①. Visually insure that the ribbon slips between the nose cover and the nose of the print head. Gently, but firmly, press down on the cassette until the two wing tabs snap into place ②.



Note:
To remove the cassette, gently spread the wing tabs and lift up the cassette.

2.4 Power Up

The power switch is located on the right side of the printer toward the front. It is used to turn the AC power ON or OFF. When the power is supplied to the printer, the power indicator light on the front panel will light.

The following procedures should be followed when turning the printer on:

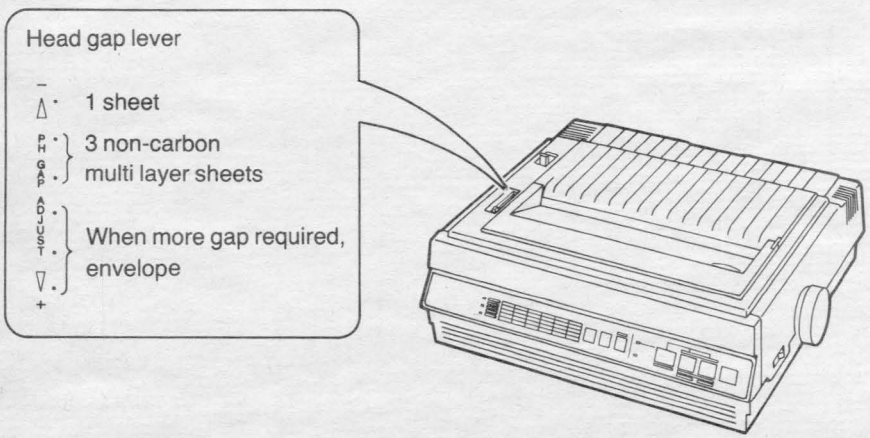
1. Be sure the ribbon is installed correctly.
2. Turn the power switch off and plug the power cord into an outlet of the proper rating.
3. Turn the power on.

2.5 Adjusting the Printing Head Gap

The distance between the print head and platen can be adjusted to compensate for the thickness of the paper.

The 6-position head gap lever moves the print head closer to or farther away from the platen approximately 0.0028 inch (0.07 mm) per step. To avoid the possibility of print head or ribbon damage, the head gap lever should normally be set to the upper position (−) when printing on single sheet paper. For thick paper or multi-part forms, move the lever toward the lower position (+). Maximum paper thickness is 0.013 inch (0.32 mm).

If an ink smear occurs when loading paper or during printing, move the lever toward the lower position (+) until the smear no longer appears.



2.6 Paper Installation

The paper feed mechanism uses friction for single sheet paper or envelopes and tractors for continuous fanfold paper. Alternating between the two is accomplished by using the lever on the left side of the printer labeled "F"(friction), "T Pull"(pull tractor), and "T Push" (push tractor). In friction mode the paper is held by pinch rollers which press the paper against the platen. Push tractors allow continuous forms to be torn off without wasting a sheet between printouts. Pull tractors provide better control for labels and multipart forms.

Single Sheets and Envelopes

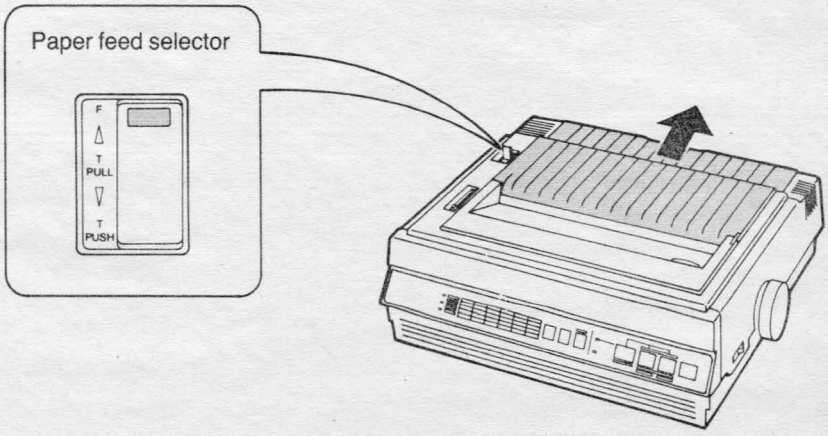
To install a single sheet of paper or envelopes, follow these procedures.

(1) Turn the power switch ON. A one second beep will sound.

(2) Make sure that the head gap lever position is appropriate to the type of paper being used. Refer to Section 2.5 on page 2-4.

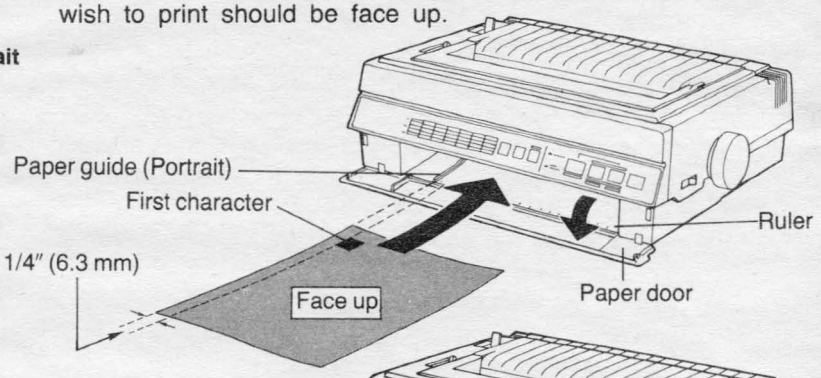
(3) Verify that the paper feed selector is in the "F" position.

(4) Make sure the top cover is positioned in the rear position by sliding the cover toward the rear of the printer until you feel some resistance.

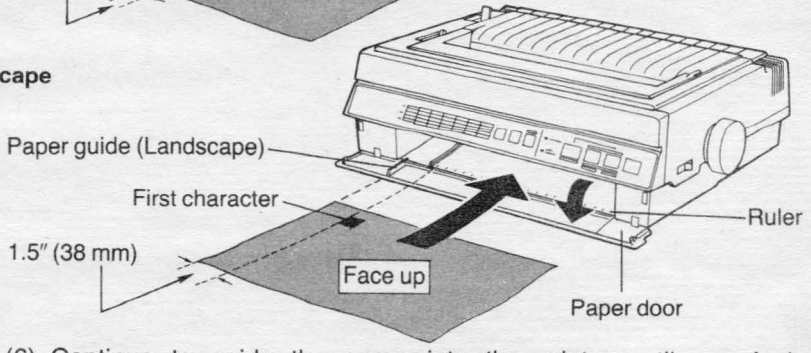


(5) Open the paper door and begin inserting the paper by using the paper guide to insure proper alignment. The side on which you wish to print should be face up.

Portrait



Landscape



(6) Continue to guide the paper into the printer until you feel resistance.

(7) Press the FUNCTION switch and the ON LINE indicator light will blink.

(8) Press the ON LINE switch (MEMO LOAD) to load paper to the first print line.

(9) If required, align the paper by setting the paper feed selector to the "T PULL" position. This releases the pinch rollers so you can position the paper as required. Set the selector back to "F".

(10) To reposition the first print line, use the LF switch as the MICRO LINE FEED function. (See Section 3.1 for more details.)

(11) Press the ON LINE switch to enable printing. (ON LINE indicator light should be lit.)

Continuous Fanfold Paper with Pull-Tractor

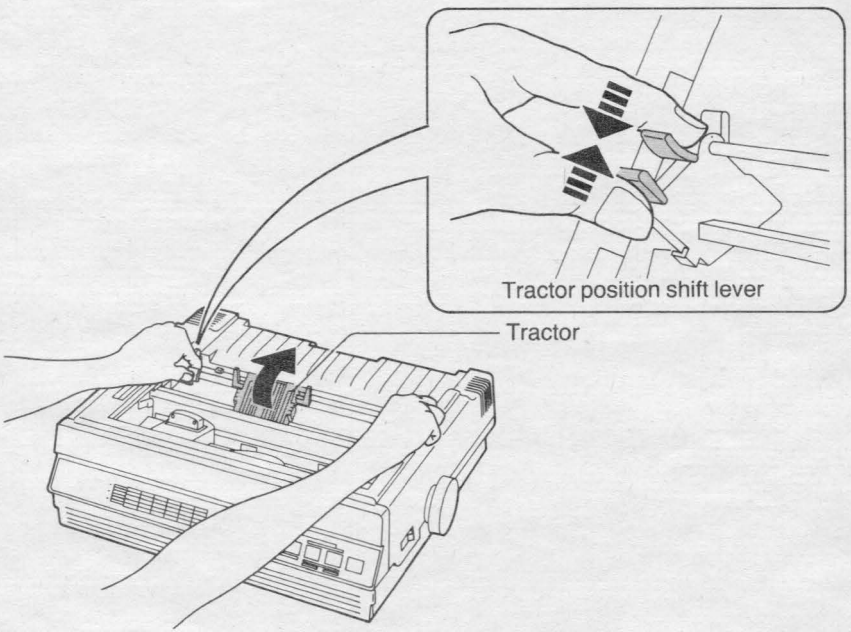
The following steps describe how to load continuous paper with pull-tractor.

(1) Turn the power switch ON. A one second beep will sound.

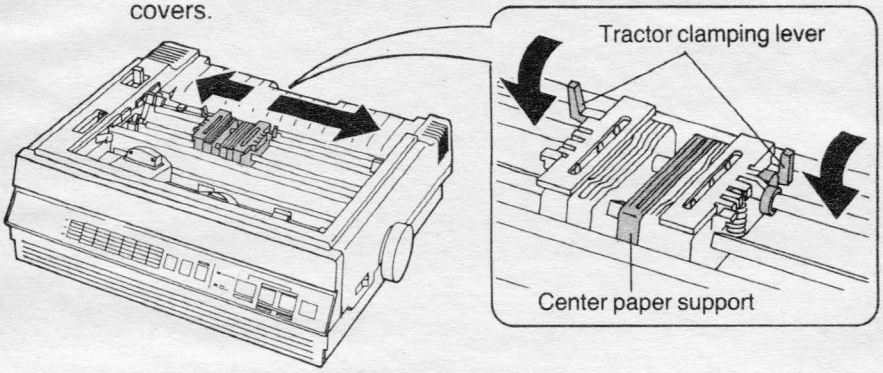
(2) Make sure that the head gap lever position is appropriate to the type of paper being used. Refer to Section 2.5 on page 2-14.

(3) Remove the top cover and smoked plastic cover.

(4) Pull up the tractors by pinching both tractor position shift levers and rotating the tractors upward (see the following figure). As you lift, release the rear levers, continue lifting until tractors snap into place.

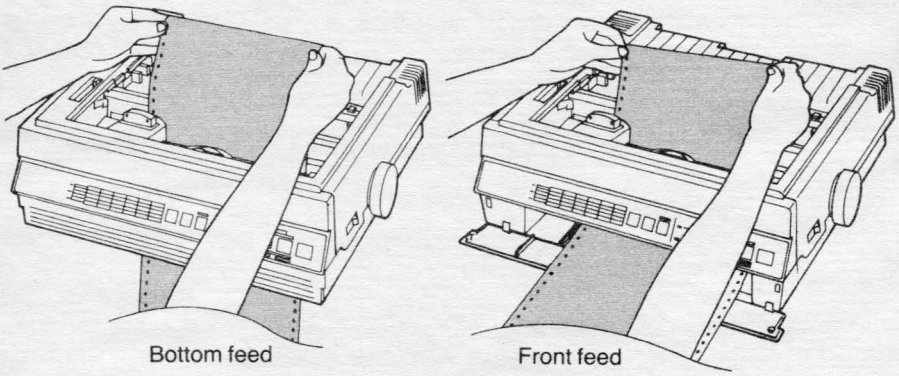


(5) Unlock the tractors by pulling forward on the tractor clamping levers. Slide the tractors out toward the sides and raise the tractor covers.



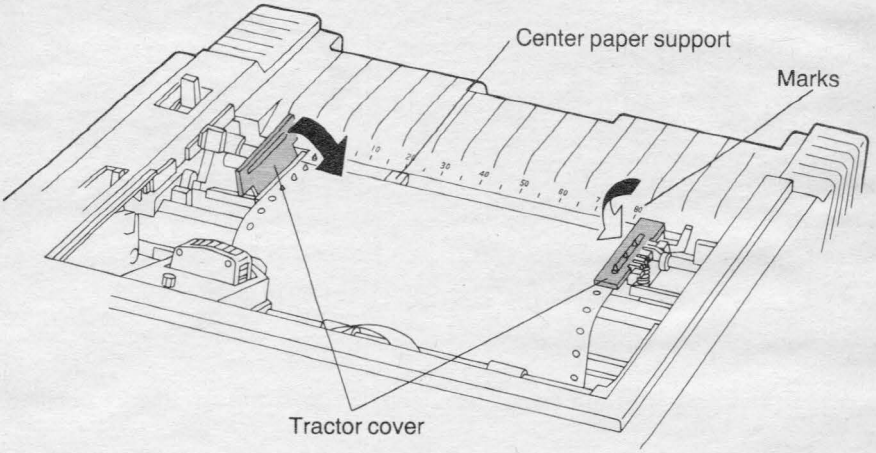
(6) Verify that the paper feed selector is in the "T PULL" position.

(7) Insert the continuous fanfold paper through bottom slot and pull it up as shown. (You can also insert the continuous fanfold paper through the front of the printer.)



Note:
When feeding fanfold paper through the front paper door paper types and condition, as well as temperature and humidity conditions may effect accurate line feeding and print quarity. For optimum output bottom feed is recommended.

(8) Align the paper sprocket holes with tractor pins and close tractor covers. Make sure the paper is straight.



(9) Visually insure the tractor pins are in the center of the paper sprocket holes.

(10) Align the paper horizontally without any slack, by using the marks on the rear cabinet as a guide. The printer will print between 0 and 80 on the scale.

(11) Align the center paper support so that it is centered between the tractors.

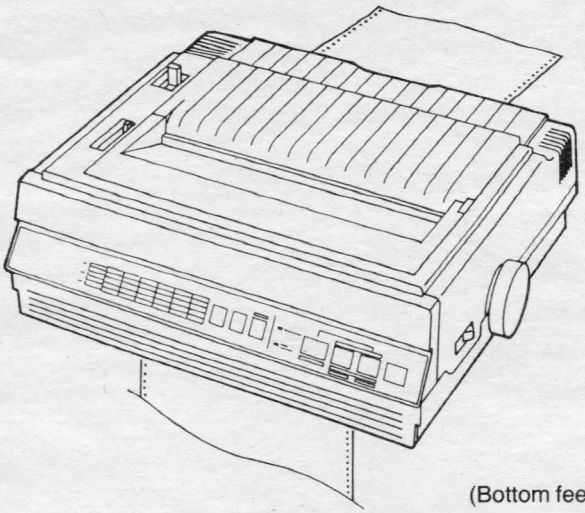
(12) Press back on the tractor clamping levers locking the tractors in place.

(13) Rotate the platen knob or use the LF switch to adjust the paper so that it is at the desired first print position.

(14) Turn the power off, wait a moment then turn the power on to set top of form.

(15) Replace the top cover so that it is totally forward.

(16) Replace the smoked plastic cover, inserting front first.



(Bottom feed)

(17) Verify that the printer is ON LINE to enable printing. (ON LINE indicator light should be lit.)

Note:
In pull tractor, if you use the functions accompanied with reverse feed, such as ESC+j (Epson LQ-2500 mode), ESC+w (Epson LQ-2500 mode) and ESC+[+@ (IBM Proprinter X24 mode) commands, the paper will not feed correctly and print out result may not be correct.

Continuous Fanfold Paper with Push-Tractor

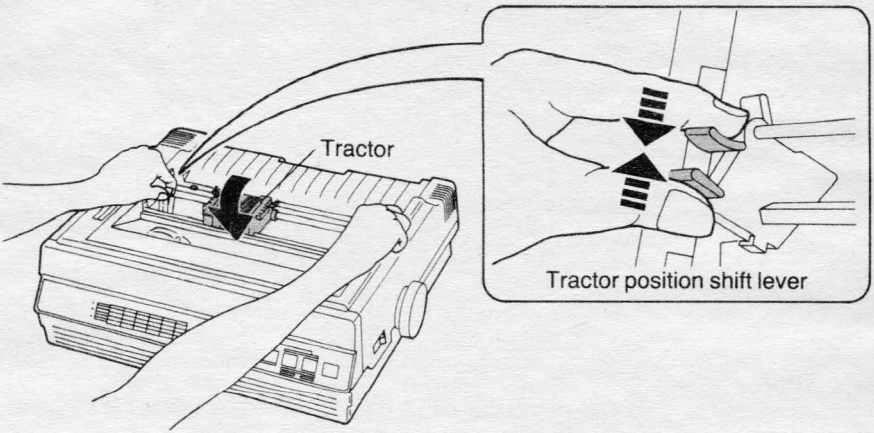
The following steps describe how to load continuous paper with push-tractor.

(1) Turn the power switch ON. A one second beep will sound.

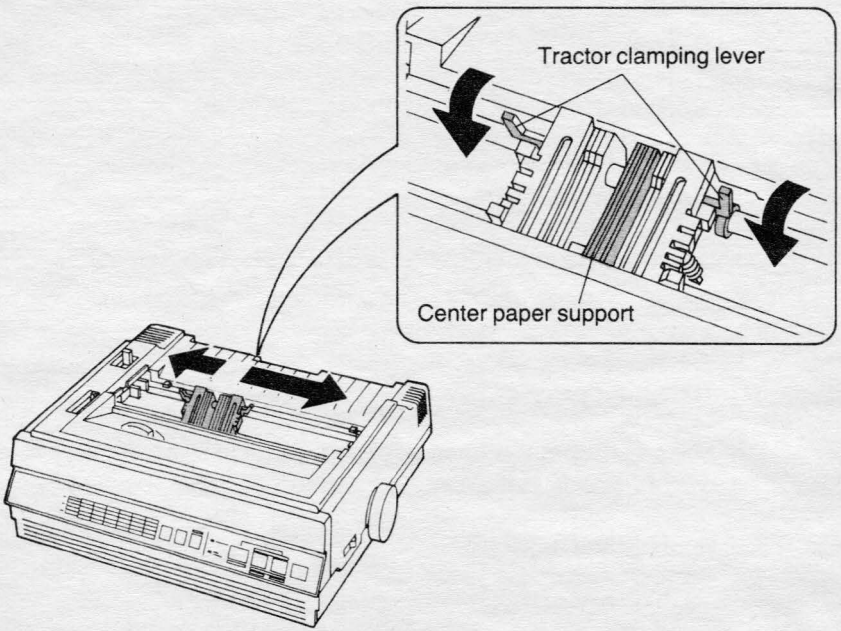
(2) Make sure that the head gap lever position is appropriate to the type of paper being used.

(3) Remove the top cover.

(4) If the tractor is in the "pull" or up position, push it down to the "push" position by pinching both tractor position shift levers and rotating the tractors downward. Release the rear lever and continue rotating until the tractor snaps into place.



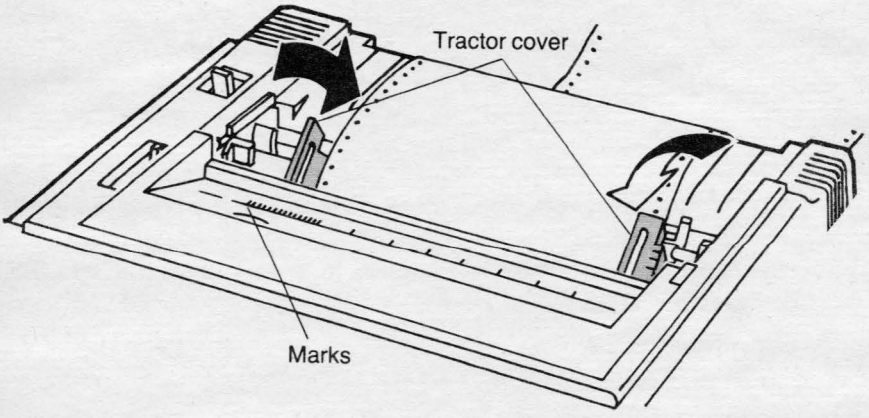
(5) Unlock the tractors by pulling forward on the tractor clamping levers. Slide the tractors out toward the sides and raise the tractor covers.



(6) Align the center paper support so that it is centered between the tracks.

(7) Verify that the paper feed selector is in the "T PUSH" position.

(8) Align the paper sprocket holes with tractor pins and close tractor covers as shown. Make sure paper is straight.



(9) Align the paper horizontally without any slack, by using the marks on the smoked plastic cover as a guide. The printer will print between 0 and 80 on the scale.

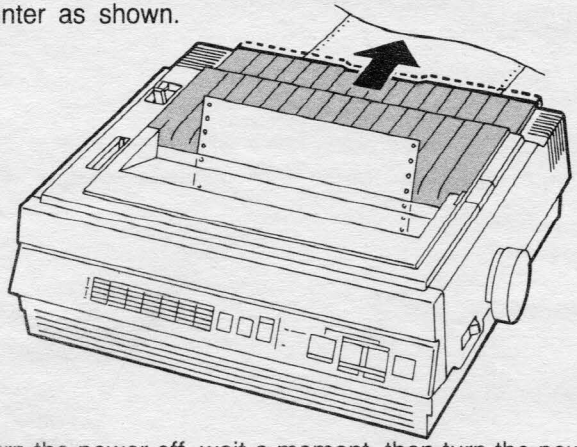
(10) Press back on the tractor clamping levers locking the tractors in place.

(11) Press the Function switch and the ON LINE indicator light will blink.

(12) Press the ON LINE switch (MEMO LOAD) to load the paper to the first print line.

(13) If you desire a different top of form, rotate the platen knob or use the LF switch or the MICRO LINE FEED function to position the paper at the desired "Top of Form". (See Section 3.1 for more details.)

(14) Replace the top cover. Slide the top cover toward the rear of the printer as shown.



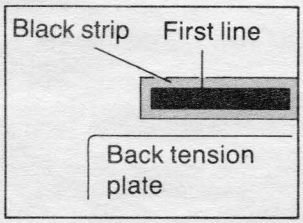
(15) Turn the power off, wait a moment, then turn the power on to set top of form.

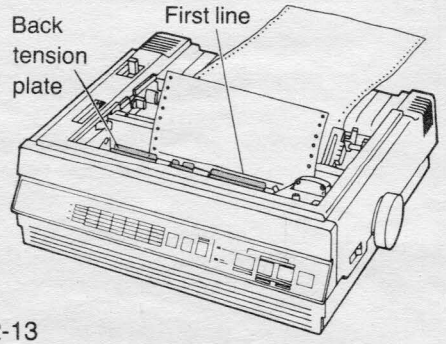
(16) Verify that the printer is ON LINE to enable printing. (ON LINE indicator light should be lit.)

2.7 Aligning the Top of Form

This printer has a line counter which keeps track of the vertical position of print head. Each time power is turned on, the line counter is reset and the current position of the head is designated as line one. This location is referred to as TOP OF FORM. A page is defined by setting the Control Table on the front panel or through the page length designation command. The first line of text will begin in the middle of the black strip on the flat platen.

To align the top of form, rotate the platen knob or use the LF switch or MICRO LINE FEED function (see Section 3.1), turn printer off, wait a moment, then turn printer on.





2.8 Self Test

The printer has a self test feature which allows the user to test the printer independently. The mode is entered by turning on the power switch while pressing the LF switch. First, all ASCII characters will be printed in draft and all five LQ fonts in 10 cpi. Then they will be printed in draft mode for approximately 20 minutes. During this phase, you may change the font by pressing the COLUMN switch. (The change will not occur until the current line is finished.) To release the self test mode, turn the power switch off.

```
Version
Draft
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
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Courier
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!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
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Bold PS
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
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Script
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Sans serif
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopq
```

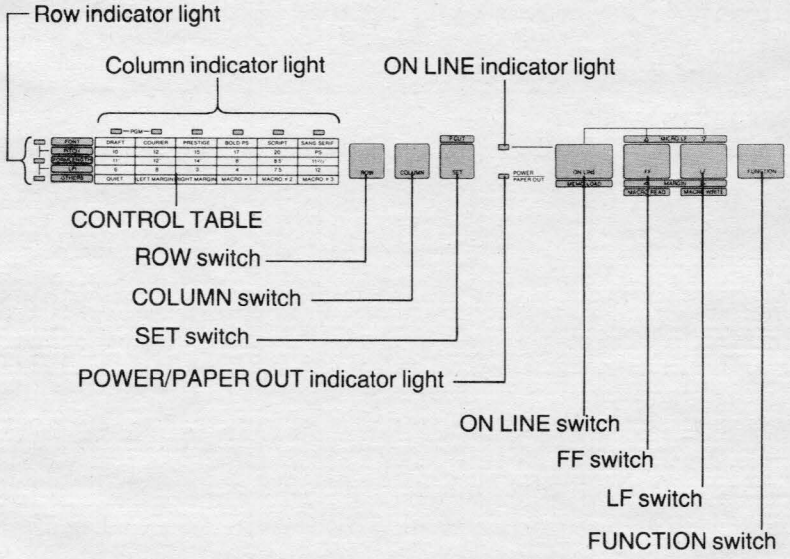
2.9 Connecting to Computer

The printer communicates with the computer through an interface cable. The PR-2417 has Centronics Parallel interface as standard. An additional RS-232C serial interface is available as an option. The user needs an interface cable to connect the printer to the computer. See Section 8 "Interfacing" for detailed information.

3. Operation

3.1 EZ Set Operator Panel

This printer has seven switches and Control Table on the EZ Set Operator panel. These key switches allow you to select various important features and functions of the printer by setting the Control Table.



FUNCTION switch

This switch is used in conjunction with the EZ Set Operator panel switches to give them new functions. When this switch is activated, the ON LINE indicator light starts blinking.
In this mode, the printer has the following functions:

1. **Setting the Control Table**
   Selecting the Print Font, Print Pitch, Form Length, Line Per Inch (LPI) etc.

2. **MEMO LOAD**
   This printer can automatically load single sheet, envelopes and continuous fanfold paper. In addition, this printer can "Park" the continuous fanfold paper (when push-tractor mode is used).
   See Section 3.2 "Function mode" for detailed information.

ON LINE switch

The ON LINE switch opens and closes the communication lines with the computer. When the power switch is turned on and paper is installed, the printer will power up in the ON LINE mode, and the ON LINE indicator light will be lit. The printer can be switched between the ON LINE and OFF LINE modes by pressing the ON LINE switch. In the ON LINE mode, the printer is able to receive information from the computer and the ON LINE indicator will be lit. In the OFF LINE mode, the indicator light will be out and the printer can no longer receive data.

This switch is also used to allow the following two functions:

1. **MICRO LINE FEED**
   In the OFF LINE mode or when the printer is not printing in the ON LINE mode, MICRO LINE FEED can be performed by pressing the LF or FF switch while pressing the ON LINE switch. (See LF and FF switch for detailed information.) This is very useful when setting Top of Form with custom forms.

Note: MICRO LINE FEED cannot be used in the pull tractor mode.

2. **MEMO LOAD (in the Function mode)**
   See Section 3.2 "Function mode" for detailed information.

FF (Form Feed) switch

This switch is active in the OFF LINE mode and when the printer is not printing in the ON LINE mode. When you press the FF switch, the print head moves to the center and the paper is advanced from its current location to the top of the next page. Then a new top of form is established.

This switch is also used to allow the following three functions:

1. **FORWARD MICRO LINE FEED**
   In the OFF LINE mode or when the printer is not printing in the ON LINE mode, FORWARD MICRO LINE FEED can be performed by pressing the FF switch while pressing the ON LINE switch.

2. **Moves carriage toward left**
   In the Function mode, when the Control Table is in the LEFT MARGIN or RIGHT MARGIN position, the carriage moves toward left by pressing the FF switch.
   See Section 3.2 "Function mode" for detailed information.

3. **MACRO READ**
   In the Function mode, when the Control Table is in the MACRO#1, 2 or 3 position, the FF switch sets the MACRO#1, 2 or 3 read mode (i.e. recall previously saved Control Table settings).
   See Section 3.2 "Function mode" for detailed information.

LF (Line Feed) switch

This switch is active in the OFF LINE mode and when the printer is not printing in the ON LINE mode. Pressing the LF switch will cause the paper to advance one line. Multiple line feeds can be performed by holding the switch down. If the print head is in the skip perforation area, (see Section 3.3 Initial Setup mode for detailed information) the paper will advance to the top of the next page.

This switch is also used to allow the following three functions:

1. **REVERSE MICRO LINE FEED**
   In the OFF LINE mode and when the printer is not printing in the ON LINE mode, REVERSE MICRO LINE FEED can be performed by pressing the LF switch while pressing the ON LINE switch.

2. **Moves carriage toward right**
   In the Function mode, when the Control Table is in the LEFT MARGIN or RIGHT MARGIN position, the carriage will move toward right by pressing the LF switch.
   See Section 3.2 "Function mode" for detailed information.

3. **MACRO WRITE**
   In the Function mode, when the Control Table is in the MACRO#1, 2 or 3 position, the LF switch sets the MACRO#1, 2 or 3 write mode (i.e. saves the Control Table settings into the printer's memory).
   See Section 3.2 "Function mode" for detailed information.

ROW switch

The ROW switch allows the user to change row position on the Control Table. When the switch is pressed, the row position on the Control Table will advance to the next position. The row indicator lights (R1, R2, R3) on the front panel indicate the current line as shown.

R1	R2	R3	ROW
ON	OFF	OFF	FONT (1st row)
ON	ON	OFF	PITCH (2nd row)
OFF	ON	OFF	FORM LENGTH (3rd row)
OFF	ON	ON	LPI (4th row)
OFF	OFF	ON	OTHERS (5th row)

Note: The ROW switch is not available when the printer is printing.

Control Table

		C1	C2	C3	C4	C5	C6
		PGM					
R1	FONT	DRAFT	COURIER	PRESTIGE	BOLD PS	SCRIPT	SANS SERIF
	PITCH	10	12	15	17	20	PS
R2	FORMLENGTH	11"	12"	14"	8"	8.5"	11 2/3"
	LPI	6	8	3	4	7.5	12
R3	OTHERS	QUIET	LEFT MARGIN	RIGHT MARGIN	MACRO # 1	MACRO # 2	MACRO # 3

R1, R2, R3: Row indicator light
C1~C6: Column indicator light

COLUMN switch

The COLUMN switch allows the user to change the column position on the Control Table. The column indicator lights (C1~C6) on the Control Table indicate the current column position.

Notes:

- **This switch is operational only in the Function mode or Initial Setup mode.**
- In the Function mode, a steady column light indicates that this is the current setting. A blinking light indicates a setting which can be selected by pressing the SET switch.
- When both C1 and C2 are ON, the printer is in PGM (program) mode which allows software to determine which Font and/or Pitch will be used.

SET switch

The SET switch sets the following two functions according to the Function or ON LINE mode.

1. In the Function mode, the current Control Table selection is set and/or released by pressing the SET switch.
   See Section 3.3 "Function mode" for detailed information.

2. The PERFORATION CUT function can be performed with the printer in either ON LINE or OFF LINE but not in the Function mode. Additionally, the following conditions must be met.

   —Paper feed selector is in the "T PUSH" position.
   —Paper is installed.
   —Printer is not printing in the ON LINE mode.
   —Printer is not accepting data in the receive buffer.

Note:
The PERFORATION CUT must be used only when the printer is in the push tractor mode. If it is used in any other mode the printer cannot feed the paper properly.

3.2 Function mode

To enter the Function mode, press the FUNCTION switch. The ON LINE indicator light will start blinking.
In the Function mode, the EZ Set Operator panel switches have new functions as follows:

Panel Switch	Function
FUNCTION	Enters or exits the Function mode
LF	Moves the carriage toward right (when the Control Table is in the RIGHT/LEFT MARGIN position)
	Sets the MACRO#1, 2 or 3 write mode (when the Control Table is in the MACRO#1, 2 or 3 position)
	Not operational when the Control Table is not in the above mentioned positions (If pressed, error sound will occur)
FF	Moves the carriage toward left (when the Control Table is in the RIGHT/LEFT MARGIN position)
	Sets the MACRO#1, 2 or 3 read mode (when the Control Table is in the MACRO#1, 2 or 3 position)
	Not operational when the Control Table is not in the above mentioned positions (If pressed, error sound will occur)
ON LINE	MEMO LOAD (will load paper if paper is not installed or will "park" paper if paper is installed)
SET	Sets and/or releases current Control Table position
	Performs the read or write of the MACRO#1, 2 or 3
	Prints the current setting condition of the Control Table when the R1, R2 and R3 indicators are all ON
COLUMN	Advances to the next column position on the Control Table
ROW	Advances to the next row position on the Control Table

Setting the Control Table

In the Function mode, the Row indicator lights R1, R2 and R3 and Column indicator lights C1~C6 on the EZ Set Operator panel indicate the Control Table condition as follows:

Row Indicator Lights			Row Items	
R1	R2	R3		
ON	OFF	OFF	1st row	FONT
ON	ON	OFF	2nd row	PITCH
OFF	ON	OFF	3rd row	FORM LENGTH
OFF	ON	ON	4th row	LPI
OFF	OFF	ON	5th row	OTHERS
ON	ON	ON	6th row	Print current Control Table settings

Colmn items / Row items		Column indicator lights (ON or blinking.)						
		C1 & C2	C1	C2	C3	C4	C5	C6
1st row	FONT	Pgm*	Draft	Courier	Prestige	Bold PS	Script	Sans Serif
2nd row	PITCH	Pgm*	10 cpi	12 cpi	15 cpi	17 cpi	20 cpi	P S
3rd row	FORM LENGTH	—	11"*	12"	14"	8"	8.5"	11⅔"
4th row	LPI	—	6 lpi*	8 lpi	3 lpi	4 lpi	7.5 lpi	12 lpi
5th row	OTHERS	—	Quiet mode	Left margin	Right margin	Macro #1	Macro #2	Macro #3
6th row		Print current Control Table settings						

Notes:

- * is initial setting when shipped.
- Column indicator lights will not reflect printer conditions set by software override.
- Other initial settings when shipped.:
  Quiet mode ..... OFF
  Left Margin ..... 0 column (10 cpi)
  Right Margin ..... 80 column (10 cpi)
  Macros ..... Initial setting when shipped

Selecting the Print Font, Print Pitch, Form Length and LPI

To select or change font, pitch, form length or lines per inch, use the ROW switch to select the appropriate row. Then press the column switch to advance the column position to the desired one. Pressing the SET switch makes the actual selection.

Notes:

- The DRAFT in the Print font and the PS in the Print pitch can not be set simultaneously. The second entry will be ignored and the alarm will sound.
- When the Print Font is set to Draft, and the Print Pitch to PGM, via the EZ Set Operator Panel, if the software issues a PS command, the printer will execute the 10 cpi (PICA) instead of PS.
- When the Pitch is set to PS and the Font is set to PGM through the EZ Set Operator Panel, if the default font is Draft, output will be printed in Courier PS.
- If the Default is a LQ font, output will be in that font. If the printer is in a LQ font mode when a Draft command is issued, the command will be ignored and output will remain in that LQ font.
- Font and Pitch selections through software commands are effective only when the printer is in the PGM mode.
- The setting of Form Length and LPI also can be changed through software commands, which override the Control Table settings. Changes through software commands will not be reflected through the Control Table indicators.

Setting/Releasing the Quiet mode

The Quiet mode reduces printing noise; however, it also reduces the printer's speed.
When the Control Table is in the 5th row position and the column position is in the Quiet mode, the SET switch sets and releases the Quiet mode.
When the Quiet mode is set, the indicator light C1 will be lit. If the Quiet mode is released, the light will blink.

Setting the LEFT/RIGHT MARGIN

When the Control Table is in the 5th row position and the column position is in the LEFT MARGIN (C2) or RIGHT MARGIN (C3), you can set the left or right margin with the LF, FF and SET switches with the following procedures.

(1) The LF, FF and SET switch has the following functions in the above mentioned condition.

Panel switch	Function
LF	Moves carriage toward right
FF	Moves carriage toward left
SET	Sets left/right margin position

(2) Press and hold down the LF or FF switch to move the carriage to a desired right or left margin position.

(3) Press the SET switch to set the left or right margin.

Notes:

- You can set either left or right margin first.
- When the carriage is moved by using LF and FF switches, if it reaches the end of the platen, the carriage will move rapidly to the opposite side.
  This is helpful in moving the carriage to the second margin position when the first is far from it.
- Settings can be changed through software commands.
- If the right margin is set to the left of a previously set margin, the left margin is reset to zero. If the left margin is set to the right of a previously set right margin, the right margin is reset to eighty (10 cpi).

Reading/Writing the MACRO#1, 2 or 3

Three combinations of default print modes can be created and stored as MACROS in the printer. Each combination can define defaults for Font, Pitch, Page Length, LPI, Quiet mode and Left/Right margin.

To define a MACRO:

1. Set the desired combination on the Control Table (see Section 3.2).
2. Use the ROW and COLUMN switches to illuminate the desired MACRO.
3. Press the LF switch and the alarm will sound two times.
4. Press the SET switch to perform MACRO WRITE.

To have the printer read and implement a previously defined MACRO:

1. Use the ROW and COLUMN switches to illuminate the desired MACRO.
2. Press the FF switch and the alarm will sound one time.
3. Press the SET switch to performs MACRO READ.

Note:
MACRO#1 is the initial setting. When powered on, the printer reads MACRO#1 automatically.

Printing the current Control Table setting and MACRO definitions:

1. Press the FUNCTION switch.
2. Press the ROW switch until all Row indicator lights are illuminated.
3. Press the SET switch to print them.

MEMO LOAD

This printer can use single sheet, envelopes and continuous fanfold paper. You can use single sheet paper or envelopes without removing the continuous fanfold paper (in "Push" tractor mode):

(1) Tear off the printed pages of the continuous fanfold paper.

(2) With the power on, press the FUNCTION switch. The ON LINE indicator will start blinking. This indicates the printer is in the Function mode.

(3) Press the ON LINE switch. The carriage will move to the center and the continuous fanfold paper will go back to a parked position. The ON LINE indicator will stop blinking and the printer automatically goes back to an OFF LINE status mode.

(4) Move the paper feed selector to "F" position.

(5) Open the front door and begin inserting the paper by using the paper guide to insure proper alignment. The side on which you wish to print should be face up.

(6) Continue to guide the paper into the printer until you feel some resistance.

(7) Press the Function switch and the ON LINE indicator light will blink.

(8) Press the ON LINE switch (MEMO LOAD) to load paper to the first print line.

(9) If required, align the paper by setting the paper feed selector to the "T PULL" position. This releases the pinch rollers so you can position the paper as required. Set the selector back to "F" position.

(10) To reposition the first print line, use the LF or FF switch as the MICRO LINE FEED function. (See Section 3.1 for more details.)

(11) Press the ON LINE switch to enable printing. (ON LINE indicator light should be lit.)

When printing on the single sheet is done, remove it by rotating the platen knob clockwise or pressing the FF switch. Then move the paper feed selector to "T PUSH" position and press the FUNCTION switch. Press the ON LINE switch to advance the continuous fanfold paper to the printing start position.

3.3 Initial Setup mode

The printer allows the user to select the following 14 Initial Setup mode conditions. This replaces conventional DIP switches. (Factory settings are denoted with *.)

(1) Printer emulation mode and character set mode

LQ-2500 Italic* .... Epson LQ-2500 emulation, Italic character set

LQ-2500 Graphic ..... Epson LQ-2500 emulation, Graphic character set 2

Proprinter X24G1 .. IBM Proprinter X24 emulation, Graphic character set 1

Proprinter X24G2 .. IBM Proprinter X24 emulation, Graphic character set 2

(2) Default print font mode

Selects one of 6 fonts—Draft*, Courier, Prestige, Bold PS, Script and Sans Serif

(This selection determines the default setting only when the font selection in MACRO is in PGM mode.)

(3) International character set mode

Selects one of 13 international character sets—USA*, France, Germany, England, Denmark 1, Sweden, Italy, Spain 1, Japan, Norway, Denmark 2, Spain 2 and Latin America

(Refer to page A-7.)

(4) Print Direction (Image print) mode
ON* ..... Unidirectional printing
OFF ..... Bidirectional printing

(5) Skip perforation mode
ON ..... Skip perforation 1 inch
OFF* ..... No skip
(This setting can be changed through software commands.)

(6) Automatic Line Feed mode
ON ..... CR+LF
OFF* ..... CR only
(This setting can be changed through software commands.)

(7) Automatic CR mode
ON ..... Causes Automatic CR on LF, VT, ESC+J
OFF* ..... Prevents Automatic CR on LF, VT ESC+J
(This setting is effective only in the IBM Proprinter X24 mode.)

(8) Paper Out Detector mode
ON* ..... Detector is active.
OFF ..... Detector is ignored.

(9) Download buffer control mode
ON ..... Download is available (enable).
OFF* ..... Download is not available (disable).
[This setting is effective only when the 32K buffer option (KX-P43) is installed.]

(10) Cut Sheet Feeder mode
ON ..... C.S.F. installed
OFF* ..... C.S.F. not installed
[This setting is effective only when the paper feed selector is in the "F" position and the cut sheet feeder option (KX-P36) is installed.]

(11) Buzzer sound control mode
ON* ..... Buzzer sounds.
OFF ..... Buzzer does not sound.
(This setting is availble only for BEL command.)

(12) Zero font mode
ON* ..... Zero (0)
OFF ..... Zero slash (Ø)
(When the International Character Set is set to Norway, zero slash is printed as Ø.)

(13) Alternate Graphic mode (AGM)
ON ..... Alternate Graphic mode ON
OFF* ..... Alternate Graphic mode OFF
(This setting is effective only in the IBM Proprinter X24 mode.)

(14) Data length
ON ..... 7 bit data length
OFF* ..... 8 bit data length

The mode is entered by turning on the power switch while pressing the Function switch. The ON LINE indicator will start blinking. This indicates the printer is in the Initial Setup mode.

In the Initial Setup mode, you can set the Initial Setup condition by using the ROW, COLUMN, SET and FUNCTION switches on the front panel as follows:

ROW switch

When the ROW switch is pressed, the row position will advance sequentially from 1st to 7th. The column indicator lights C1~C6 shows the current setting for that row.

Row indicator light				Column indicator light (ON=lit, OFF=blink)					
R1	R2	R3	Row	C1	C2	C3	C4	C5	C6
ON	OFF	OFF	1st	LQ-2500 Italic	LQ-2500 Graphic	IBM X24 G1	IBM X24 G2	—	—
ON	ON	OFF	2nd	Draft	Courier	Prestige	Bold PS	Script	Sans Serif
OFF	ON	OFF	3rd	USA	France	Germany	England	Denmark 1	Sweden
OFF	ON	ON	4th	Italy	Spain 1	Japan	Norway	Denmark 2	Spain 2
OFF	OFF	ON	5th	Latin America	Print Direction	Skip	Auto LF	Auto CR	P.O Detect
ON	ON	ON	6th	Current Control Table condition print mode					
BLK	OFF	OFF	7th	DLL Buffer	C.S.F	Buzzer	Zero slash	AGM	Data Length

ON=light is lit, BLK=light is blinking, OFF=light is out

Refer to Appendix G2 and G3.

COLUMN switch

When the COLUMN switch is pressed, the column position will advance sequentially and the indicator lights C1~C6 will be lit (when the current mode position is set) or blinking (when the current mode position is not set).

SET switch

To adjust the Initial Setup mode, use the ROW and COLUMN switches to identify the option to be changed. There are two types of selection: individual and group. Pressing the SET switch for an "individual" cell toggles between ON (the column indicator light is steady) and OFF (the light blinks) conditions. To keep the current setting, simply go to a different option. The group type works in conjunction with other cells all of which are mutually exclusive (if one is YES, all others must be NO). Font choices, for example, are of this type. Since only one font can be current, when one is chosen (YES—column indicator light is lit), all others are "deselected" (NO—lights are OFF). Advancing the column setting will cause the column indicator light to blink at each alternate choice. Pressing the SET switch for such a choice selects that choice and turns the previous setting OFF.

Press the FUNCTION switch to return to the normal mode.

3.4 Detectors

Paper Out detector

The Paper Out detector is located under the platen and senses the absence of paper. When an out of paper condition occurs, the printing stops, the printer goes to the OFF LINE mode, the alarm sounds and the Paper Out light starts blinking. To continue printing to the end of the current page when an out of paper condition occurs, press the ON LINE switch repeatedly until the page is completed. To start printing the next page, install new paper and press the ON LINE switch. The printer will resume printing.

Note:
The Paper Out detector can be disabled through the Initial Setup mode.

Overheat detector

If the printer is printing continuously for extended periods of time, the print head may become overheated. When this occurs, an internal protective circuit will cause the printer to pause until the head temperature decreases sufficiently, at which time the printer will automatically resume printing without loss of data. This feature is included to extend the life of the print head.

3.5 Initialization

The printer is initialized under the following conditions:
the AC power is turned on
the $\overline{\text{PRIME}}$ signal is received
the RESET printer command is received

When the printer is initialized, the following conditions are set:
—the print buffer is cleared
—the receive buffer is cleared (not cleared by RESET PRINTER command)
—the download character buffer is cleared (not cleared by $\overline{\text{PRIME}}$ signal in IBM Proprinter X24 mode or by RESET PRINTER command)
—the Initial Setup modes are read and set
—horizontal tabs are set every 8 columns
—vertical tab settings are cleared
—all modes set by control and escape commands will be cleared
—present form position is designated as top of form
—the Self Test mode is cleared
—the Control Table settings are read and set
—Control Panel settings are not changed by $\overline{\text{PRIME}}$ signal or RESET PRINTER command*
—the print head goes to the home position

*Some software packages send $\overline{\text{PRIME}}$ signal at the beginning of their programs. Print modes set by the Control Table will not change.

3.6 Hex. Dump

The Hex. Dump mode is activated by turning on the power while pressing both LF switch and FF switch. In this mode, all data received from the computer is printed in hex code instead of the normal ASCII characters. Function codes for the printer (CR, LF, HT, etc.) are not executed. To reset the mode, turn the power off, then back on. This mode is very useful for debugging programs.

4. Software Introduction

4.1 Introduction

In order for a computer to communicate with a printer, both pieces of equipment must understand a common language or coding scheme. One such coding scheme is called ASCII (American Standard Code for Information Interchange). As an example, the ASCII code for the character "K" can be expressed in any of the following forms:

$(01001011)_2$—Binary
$4B_{HEX}$, $4B_H$—Hexadecimal
75_{DEC}, 75_D—Decimal

Many computers allow you to enter ASCII codes in hexadecimal form. Many computers which support ASCII allow the input to be in decimal form. Many allow you to enter the code in either form. Once entered, the ASCII codes are converted to binary form by the computer and then sent to the printer.

In the sections which follow, you will see how to enter various ASCII codes to enable the printer to perform the functions you would like. Since the decimal equivalent of the ASCII code is most commonly used, all examples which follow will use the decimal form.

Appendix A contains the ASCII character and control command tables used by this printer.

4.2 Control Codes

The various printer functions are set through the use of control codes, which consist of one or more ASCII characters entered into the computer in a special way. These control codes often differ from printer to printer. Control codes generally fall into two categories: one-byte control codes and multi-byte control codes. The multi-byte control codes are often referred to as Escape Sequences since each code begins with the ASCII code for the ESCAPE character (ESC). Such an ESC character should not be confused with the Escape Key found on some computer keyboards.

Control codes can be sent to this printer from your computer in different ways. The three most common way are:

- Through commercial software packages
- Directly from the keyboard
- From within a user written program

The latter two methods will specifically reference the BASIC language, although other languages such as FORTRAN, PASCAL, etc., can also be used. We will use BASIC since it is a relatively easy language to use. In addition, it is one of the most commonly used microcomputer languages.

4.3 Entering Control Codes through Commercial Software Packages

Many computer users do not have the time, the expertise, or the interest to develop software suited for their applications. In such cases software written by professionals can be purchased. Such software should be selected not only to meet the needs of the user, but must also be compatible with both computer and printer.

Commercial software is often written with what is called a driver. A driver is that part of the software which allows the user to configure the package to the type of printer and interface being used. Once the software has been booted, the user is generally requested to supply additional information such as:

- Brand/Model of printer being used.
- I/O port being used. (eg: LPT1:)
- Baud rate, parity, etc. if a serial interface is being used.

Once the necessary information has been supplied, the software will provide the computer with the control codes and other data needed by this printer.

When choosing Brand/Model of printer being used in your software, make sure that this selection matches your Initial Setup mode selection.

Many word processing packages will request that you enter the ASCII codes used by this printer for special settings such as underlining, compressed print, super- and subscript, italics, etc. In all cases you should refer to your software instruction manual for the proper use of the package with this printer.

4.4 Entering Control Codes Directly from the Keyboard

With many computers, the BASIC language is ready to use once you power up. With others, BASIC must be loaded from cassette or disk. In any case, once BASIC is ready, you may then enter these printer control commands directly from your computer keyboard.

BASIC requires the use of the PRINT command (or LPRINT, PRINT#, etc. depending on the type of BASIC your computer uses) to process and send the control commands to this printer. As part of this PRINT command, you must supply the appropriate ASCII code(s) for the CHR$ function.

For example, the command: **LPRINT CHR$ (15)** followed by a **RETURN** will set this printer to compressed mode. Subsequent output to this printer will appear in compressed mode.

If, after issuing the above command, subsequent PRINT statements output nothing to the printer, check for one or more of the following:

- Have you indicated to the computer that output is to the printer and not the screen? For example, PR#1, say, causes subsequent PRINT statements on the Apple computer to PRINT the printer and not the screen. LPRINT does the same in Microsoft BASIC.

- Is this printer on line? If not, press the green ON LINE button on the front panel.

- Is the interface cable plugged into the computer and printer?

- When using a serial interface, is the baud rate setting on the printer the same as that on the computer or interface card?

Notice that when you enter a BASIC command directly from the keyboard, you do NOT use a line number as you would in a BASIC program. Moreover, control codes may be entered only one line at a time.

4.5 Entering Control Codes from Within a Program

Control commands may also be entered from within a BASIC program. The advantage to this technique is that you can incorporate a number of different control commands into a single program and therefore produce output with a variety of special features. This is done by RUNning your program once. In this case BASIC requires that each line in your program be preceded by a line number.

As an example, we mentioned earlier that the command **LPRINT CHR$(15)** entered directly from the keyboard will set compressed print on this printer. From within a BASIC program, this command might be:

50 LPRINT CHR$(15)

4.6 Entering Hexadecimal Code

In the event that you will be entering ASCII codes in hexadecimal form, you must supply two extra characters per code. These are the ampersand (&) and the letter H. The example below illustrates the BASIC command to set compressed print on this printer.

Decimal	Hexadecimal
LPRINT CHR$(15)	LPRINT CHR$(&H0F)

Refer to Appendix A.

4.7 Control Codes

A number of the printer control commands require only a single ASCII-coded character as part of the LPRINT statement. The command LPRINT CHR$(15) which we discussed earlier is an example of a single-byte control command.

Multi-byte control codes, often called Escape control codes or Escape sequences, always begin with an ESC designation. ESC is designated by CHR$(27) in decimal form or CHR$(&H1B) in hexadecimal form. The ESC designation is always followed by one or more additional codes, hence the name multi-byte control code.

In BASIC, these two or more bytes are joined (or concatenated) into a single command or string using either a plus (+) sign, a semicolon(;), or by neither symbol but rather by listing one byte after another without any spaces. BASIC on many computers allows you to use any of these formats. Refer to your BASIC manual for the proper method of string concatenation.

Table 4.1 and 4.2 show equivalent methods of entering multi-byte control commands for most computers.

There is one remaining input format commonly used to reduce the keystrokes necessary to enter a multi-byte control command. As you examine the multi-byte control commands in the pages ahead, you will notice that the second byte, with the exception of ESC+SO and ESC+SI, is always a character which appears somewhere on your keyboard. In such cases rather than enter that character's ASCII code as part of the CHR$ function, you may simply enter that character in quotes ("). For example, to set pica pitch (ESC+P), you may enter:

```
LPRINT CHR$(27)+CHR$(80); or LPRINT CHR$(27)+"P";
```

As another example, to set double width printing, you may enter:

```
LPRINT CHR$(27)+CHR$(87)+CHR$(1);
                    or
LPRINT CHR$(27)+"W"+CHR$(1);
```

With this method, any of the three input formats shown in Table 4.1 and 4.2 may also be used (subject to the BASIC you are using).

	Two-Byte Command
Function **Name** **Code**	Set Pica Pitch ESC+P 27, 80$_{DEC}$
Input Format 1 **Input Format 2** **Input Format 3**	LPRINT CHR$(27)+CHR$(80); LPRINT CHR$(27);CHR$(80); LPRINT CHR$(27)CHR$(80);

Table 4.1 Two-Byte Command Input Format

	Three-Byte Command
Function **Name** **Code**	Set Double Width Printing ESC+W+1 27, 87, 1$_{DEC}$
Input Format 1 **Input Format 2** **Input Format 3**	LPRINT CHR$(27)+CHR$(87)+CHR$(1); LPRINT CHR$(27); CHR$(87); CHR$(1); LPRINT CHR$(27)CHR$(87)CHR$(1);

Table 4.2 Three-Byte Command Input Format

This printer has two printer modes. They are Epson LQ-2500 and IBM Proprinter X24. Software commands of each mode are covered in the corresponding chapter.

4.8 Special Code for IBM PC series

Since LPRINT command on IBM PC generates LF together with CR, PRINT #1 instead of LPRINT is used to prevent this, and the following two lines of BASIC program are necessary at the top of a program. For details refer to your BASIC manual.

```
10 WIDTH "LPT1:", 255
20 OPEN "LPT1:" AS #1
```

PRINT #1 does not generate CR and LF, therefore a CR and LF must be used when they are required.

5. PR-2417 Features

5.1 Print Feature Control

Print Quality and Font

This printer has a wide variety of print capabilities as shown below. The user can select any print mode by combining them.

Quality	Font	Font Style	Pitch	Highlight
Draft		Subscript	10	Double high
Letter Quality	Courier	Superscript	12	Double width
	Prestige	Italic	15*	Double strike
	Bold PS		17	Emphasized
	Script		20*	Underline
	Sans Serif		PS	Overline**

*In IBM Proprinter X24 mode, only available through the EZ Set Operator Panel.

**Available only in IBM Proprinter X24 mode.

By combining these print capabilities, you can create more than 5,500 different print styles to customize the look of your particular document.

This printer has two print quality levels: Draft and Letter Quality. Which you choose depends on your needs. Draft is printed at the fastest speed and is normally used for printing draft documents. Letter quality produces the best print quality; it is used to print the final version of formal documents. The printer has five letter quality fonts: Courier, Prestige, Bold PS, Script and Sans Serif, and can be selected either by setting the Control Table on the EZ Set Operator panel or through software. Super/subscript font characters are two-thirds the height of normal characters and are typically used in mathematical expressions, chemical formulae and footnotes.

Character Pitch

This printer has six character pitches: 10 cpi (Pica), 12 cpi (Elite), 15 cpi (Micron), 17 cpi (Compressed), 20 cpi (Elite compressed) and Proportional Spacing.

The height of the characters in the different pitches is the same; only the width varies. The first five pitches are fixed pitch (within a pitch, all characters have the same width).

In proportional spacing, character widths vary with the character. An "I", for example, takes up less space than an "M" or a "W". Proportional printing gives the document a typeset appearance. Proportional spacing cannot be printed in draft mode.

(Print Example)

10 cpi printing (Pica)
12 cpi printing (Elite)
15 cpi printing (Micron)
17 cpi printing (Compressed)
20 cpi printing (Elite Compressed)

Character Highlighting

This printer allows a document to have a variety of print styles through mixing of fonts and pitches.

Double high printing makes the height of a character twice that of a normal one.
Double width printing makes the width of a character twice that of a normal one.
Double strike printing uses a double strike with two passes of the print head, feeding the paper 1/180" (0.14 mm) between the first and second pass.
Emphasized printing is done in one pass of the print head at half speed, which allows horizontally adjacent dots to be printed.
Underline printing produces a continuous line under characters, using the 24th pin of the print head.
Overline printing produces a continuous line over characters using the first pin of the print head. This is available only in the IBM Proprinter X24 mode.

(Print Example)

Double High
Double Width
Double Strike Printing
Emphasized Printing
Underline Overline Printing

5.2 Down Line Load Characters

Should you need special characters in addition to those provided, with the 32K byte buffer option (KX-P43), you can custom design. Draft and Letter Quality (LQ) fonts are downloadable simultaneously. Draft download characters are printed when the printer is in draft mode, LQ characters when it is in LQ mode.

To download a character you must first make preparations for:
—installing the 32K buffer option (KX-P43).
—Down Line Load buffer selection is set to ON (DLL Enable) in the Initial Setup mode.

Making Maximum Use of the Buffer

Epson LQ-2500 mode
18K (18,432) bytes are available which can be divided between draft and letter quality characters in any combination, subject to hexadecimal address and buffer limits. Draft letters require 30 bytes maximum each while LQ letters require 114 maximum. To determine if the desired combination will fit, use the formula:

(# of draft characters×30)+(# of LQ characters×114)≦18,432

For example: 128 draft and 128 letter quality are desired.
(128×30)+(128×114)=3,840+14,592=18,432
therefore this combination will fit.

Because no more than 256 addresses can be identified in 1 byte (00_{HEX}–FF_{HEX}), 256 is the maximum of draft characters that can be defined. The maximum number of LQ characters that can be loaded is 161.

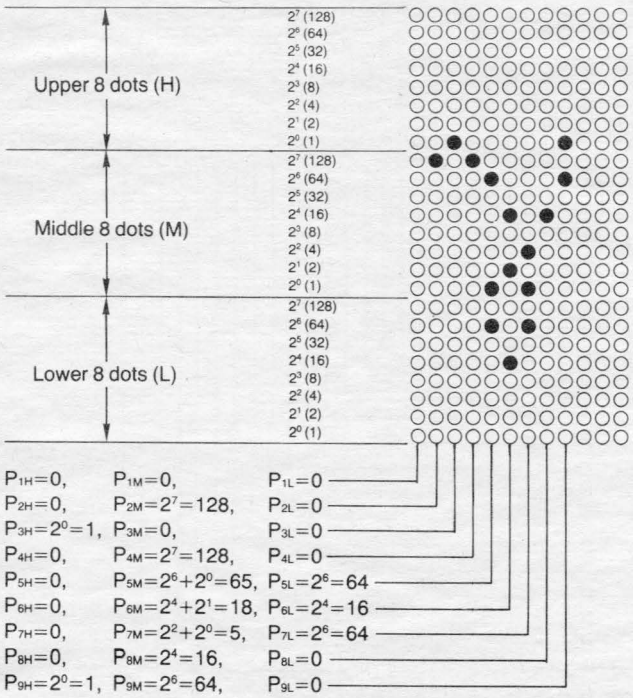
IBM Proprinter X24 mode
The 23K bytes available can be divided between draft and LQ characters in any combination. The download data also can be entered to RAM by compression. The maximum number of characters depends on the manner in which the characters are entered.

Designing Down Line Load Characters

1. Draft Font

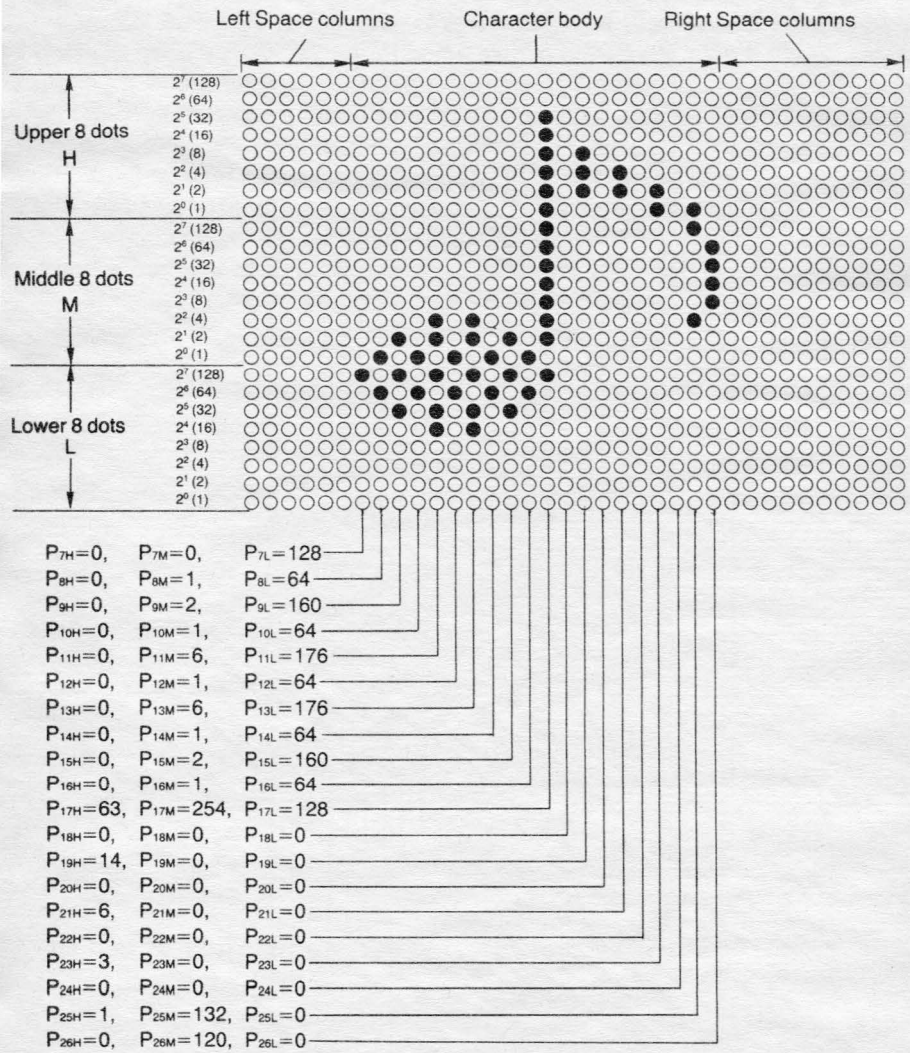
To download a character you must first design the character. A draft font download character uses 9 columns and 24 rows of dots. Since a given column contains 24 dots, each column is divided into 3 portions, upper 8, middle 8 and lower 8 dots. Column 1 is labeled P_{1H} for the upper 8 dots, P_{1M} for the middle 8 and P_{1L} for the lower 8 dots. Similarly column 9 is labeled P_{9H} for the upper 8 dots, P_{9M} for the middle 8 and P_{9L} for the lower 8 dots. Columns 10, 11 and 12 are always set to zero, thus we are working with P_{1H} through P_{9L}.

In the matrix below, the circles represent pins which may be fired. You may darken any circle provided no two adjacent horizontal circles are filled in. Once you have designed the character, you must quantify each dot column, P_{1H}– P_{9H}, by summing the powers of two represented by each dot. Consider the design of the Greek character gamma.



2. LQ Font

A LQ font download character uses 36 columns and 24 rows of dots. Designing and storing fonts can be performed in the same way as with draft fonts. Here, consider the design of the one-eighth-note character:



$P_{7H}=0$, $P_{7M}=0$, $P_{7L}=128$
$P_{8H}=0$, $P_{8M}=1$, $P_{8L}=64$
$P_{9H}=0$, $P_{9M}=2$, $P_{9L}=160$
$P_{10H}=0$, $P_{10M}=1$, $P_{10L}=64$
$P_{11H}=0$, $P_{11M}=6$, $P_{11L}=176$
$P_{12H}=0$, $P_{12M}=1$, $P_{12L}=64$
$P_{13H}=0$, $P_{13M}=6$, $P_{13L}=176$
$P_{14H}=0$, $P_{14M}=1$, $P_{14L}=64$
$P_{15H}=0$, $P_{15M}=2$, $P_{15L}=160$
$P_{16H}=0$, $P_{16M}=1$, $P_{16L}=64$
$P_{17H}=63$, $P_{17M}=254$, $P_{17L}=128$
$P_{18H}=0$, $P_{18M}=0$, $P_{18L}=0$
$P_{19H}=14$, $P_{19M}=0$, $P_{19L}=0$
$P_{20H}=0$, $P_{20M}=0$, $P_{20L}=0$
$P_{21H}=6$, $P_{21M}=0$, $P_{21L}=0$
$P_{22H}=0$, $P_{22M}=0$, $P_{22L}=0$
$P_{23H}=3$, $P_{23M}=0$, $P_{23L}=0$
$P_{24H}=0$, $P_{24M}=0$, $P_{24L}=0$
$P_{25H}=1$, $P_{25M}=132$, $P_{25L}=0$
$P_{26H}=0$, $P_{26M}=120$, $P_{26L}=0$

Entering Down Line Load Data

Epson LQ-2500 mode

1. Draft Font

Download command in the Epson LQ-2500 mode is:
ESC+&+0+n+m+d_0+d_1+d_2+DATA

Input format for download command is:
LPRINT CHR$(27)+"&"+CHR$(0)+CHR$(n)+CHR$(m)
+CHR$($d_0$)+CHR$(d_1)+CHR$($d_2$)+DATA
Programming example for the Greek character gamma is as follows:

```
10 REM Draft Download Character
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT #1,CHR$(27)+"x0";
50 PRINT #1,CHR$(27)+":"+CHR$(0)+CHR$(0)+CHR$(0);
60 PRINT #1,CHR$(27)+"&"+CHR$(0)+CHR$(65)+CHR$(65);
70 PRINT #1,CHR$(1)+CHR$(8)+CHR$(3);
80 PRINT #1,CHR$(0)+CHR$(128)+CHR$(0);
90 PRINT #1,CHR$(1)+CHR$(0)+CHR$(0);
100 PRINT #1,CHR$(0)+CHR$(128)+CHR$(0);
110 PRINT #1,CHR$(0)+CHR$(65)+CHR$(64);
120 PRINT #1,CHR$(0)+CHR$(18)+CHR$(16);
130 PRINT #1,CHR$(0)+CHR$(5)+CHR$(64);
140 PRINT #1,CHR$(0)+CHR$(16)+CHR$(0);
150 PRINT #1,CHR$(1)+CHR$(64)+CHR$(0);
160 REM Download character print
170 PRINT #1,CHR$(27)+"%"+CHR$(1);
180 PRINT #1,"A A A A A A A A A A"
190 PRINT #1,CHR$(27)+"%"+CHR$(0);
200 END
```

First determine where in RAM the character(s) should be stored. The variables "n" and "m" are used for this purpose. The value specified for "n" indicates the location into which the first download character will be stored. The value specified for "m" indicates the location into which the last download character will be stored. If you are storing a single character, then n=m.

Next define the value of "d_0", "d_1" and "d_2" which specify attribute information. The attribute information includes the following:

d_0=number of space dot columns to the left of the character body
d_1=number of character body dot columns
d_2=number of space dot columns to the right of the character body

In our sample program, we created a gamma character. This character consists of 1 left space dot column, 8 body dot columns and 3 right space dot columns. Therefore, $d_0=1$, $d_1=8$ and $d_2=3$.

In general, d_1 cannot exceed 9 and $d_0+d_1+d_2$ cannot exceed 12.

Notes:

- Program line 40 is necessary for downloading draft font and designates draft printing.
- Program lines 80~150 use the eight values P_{2H}~P_{9L} to define the shape and size of the gamma.
- Program line 170 selects download character generator. After this selection, by printing the download code [in this example, CHR$(65)="A"] the downloaded character is printed.
- Two horizontal adjacent columns cannot be printed in either draft or LQ mode.

2. LQ Font

Input format is the same as with draft fonts.

Programming example for the one-eighth-note character is as follows:

```
10 REM Define Download Letter Quality Character
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT #1,CHR$(27)+"x1";
50 PRINT #1,CHR$(27)+":"+CHR$(0)+CHR$(0)+CHR$(0);
60 PRINT #1,CHR$(27)+"&"+CHR$(0)+CHR$(65)+CHR$(65);
70 PRINT #1,CHR$(6)+CHR$(20)+CHR$(10);
80 PRINT #1,CHR$(0)+CHR$(0)+CHR$(128);
90 PRINT #1,CHR$(0)+CHR$(1)+CHR$(64);
100 PRINT #1,CHR$(0)+CHR$(2)+CHR$(160);
110 PRINT #1,CHR$(0)+CHR$(1)+CHR$(64);
120 PRINT #1,CHR$(0)+CHR$(6)+CHR$(176);
130 PRINT #1,CHR$(0)+CHR$(1)+CHR$(64);
140 PRINT #1,CHR$(0)+CHR$(6)+CHR$(176);
150 PRINT #1,CHR$(0)+CHR$(1)+CHR$(64);
160 PRINT #1,CHR$(0)+CHR$(2)+CHR$(160);
170 PRINT #1,CHR$(0)+CHR$(1)+CHR$(64);
180 PRINT #1,CHR$(63)+CHR$(254)+CHR$(128);
190 PRINT #1,CHR$(0)+CHR$(0)+CHR$(0);
200 PRINT #1,CHR$(14)+CHR$(0)+CHR$(0);
210 PRINT #1,CHR$(0)+CHR$(0)+CHR$(0);
220 PRINT #1,CHR$(6)+CHR$(0)+CHR$(0);
230 PRINT #1,CH$(0)+CHR$(0)+CHR$(0);
240 PRINT #1,CH$(3)+CHR$(0)+CHR$(0);
250 PRINT #1,CH$(0)+CHR$(0)+CHR$(0);
260 PRINT #1,CHR$(1)+CHR$(132)+CHR$(0);
270 PRINT #1,CHR$(0)+CHR$(120)+CHR$(0);
280 REM Download Character print
290 PRINT #1,CHR$(27)+"%"+CHR$(1);
300 PRINT #1,"A A A A A A A A A A"
310 PRINT #1,CHR$(27)+"%"+CHR$(0);
320 END
```

The number of printable dots for characters downloaded in the letter quality font is as follows:

	$d_0+d_1+d_2$
LQ 10 cpi	36
LQ 12 cpi	30
Proportional Spacing	42

Print Mode Combination:

- Draft Down Line Load characters can be printed only when the FONT is set to "PGM" or Draft on the Control Table.
- Letter quality download characters can be printed only when the FONT is set to "PGM" or Courier, Prestige, Bold PS, Script, Sans Serif on the Control Table.

IBM Proprinter X24 mode

Downloading fonts in IBM Proprinter X24 mode requires downloading character Dot Pattern data and character Index Table data. Dot pattern data controls which pins fire when printing a character. Index Table data is placed in a "lookup table" that provides information on where Dot Pattern data is stored in memory and defines certain attributes of the character.

The format for the command to input down line load data is:

ESC $+=+n_1+n_2+35+A_1+A_2+d_1+d_2+\ldots+d_x$

where

$n_1+(256\times n_2)$=the number of data bytes to be downloaded, 35 is a fixed number that must always be sent, A_1 and A_2 indicate the low order and high order addresses in which data is to be stored, and d_1, d_2... is the data being downloaded. This data will be in one of two formats, depending on whether it is Dot Pattern or Index Table:

Index Table Addresses

Starting memory addresses for Index Tables are:

Draft (10 and 12 cpi)	8011_{HEX}
LQ 10 cpi.....	8912_{HEX}
LQ Proportional	9213_{HEX}
LQ 12 cpi.....	$9B14_{HEX}$

To calculate the address for an individual character Index Table entry, use the equation:

Address=9×ASCII character number+starting address.

To find the address of the Index Table location for the draft letter "A":

Multiply 9×65 (ASCII character number for "A")=585_{DEC}
Convert to hexadecimal=249_{HEX}
Add starting address for draft=8011_{HEX}
yielding $825A_{HEX}$ making $A_1=5A_{HEX}$, and $A_2=82_{HEX}$.

Dot Pattern Data

Dot Pattern data is sent for all columns that must be uniquely defined. If adjacent horizontal columns are identical (or can be made identical knowing that the printer will not print adjacent horizontal dots) data compression may be used and the duplicate data need not be sent. Dot Pattern data may be stored at any address from $A414_{HEX}$ to $FFFF_{HEX}$ inclusive.

Dot columns for characters are as follows:

Draft (10 and 12 cpi) ..... 10 columns
LQ 10 cpi ..... 36 columns
LQ 12 cpi ..... 30 columns
LQ Proportional ..... 18~42 columns

It is important to note that the last column is always blank. (e.g. A download draft character is defined by 9 columns. The printer automatically adds the tenth column.)

$Data=P_{1H}+P_{1M}+P_{1L}+P_{2H}+P_{2M}+P_{2L}+\ldots+P_{nH}+P_{nM}+P_{nL}$

Index Table Data

$AA_1+AA_2+IT_1+IT_2+CM_1+\ldots+CM_5$

where

AA_1 and AA_2 indicate the address where Dot Pattern data is stored. AA_1 and AA_2 are the high order and the low order bytes respectively.

IT_1 is Index Table byte #1. Bit designation is:

Bit	0	1
7	Normal Character	Graphic Character
6	Download Character	Resident Character
5~0	Number of columns in the character memory	

IT_2 is Index Table byte #2. Bit designation is:

Bits 7, 6 Type of block graphic character
- 00 shading character
- 01 line drawing character
- 10 underscore character
- 11 not supported

Bits 5~0 number of columns in the character less 1 (e.g. for draft characters, $10-1=9_{DEC}=(001001)_2$ bits 5~0 =001001)

CM_1~CM_5 are compression mask bits. (0=no compression, 1=compression)

CM_1 bit 7=1st dot column
bit 6=2nd dot column

⋮

CM_5 bit 3=37th dot column
bit 2=38th dot column
bit 1=39th dot column
bit 0=40th dot column

Notes:

- All block graphic characters are 30 dots high, even though only 24 dots are defined for each column. An underline is defined as a blank block graphic character (all zeros). The underline is generated by the printer during the second pass. A shadow character repeats dots 1~6 of each column as dots 25 through 30 respectively. A line draw character repeats dots 23 and 24 as the pairs 25 and 26, 27 and 28, and 29 and 30.
- Entry data can designate any character data image whether resident or downloaded. Multiple table entries can designate the same character. The address of an undefined entry should be 000. An undefined entry is printed as a space.
- Location 0 (00_{HEX}) normally stores the slashed zero. If a character is downloaded into this location, when the slashed zero is selected in the Initial Setup mode, the downloaded character will print in place of any zero.

Data Compression

Data Compression allows the efficient use of memory in storing down line loaded characters providing space for more characters than would be available without compression. The printer repeats the previous dot column in the current column when the current column compression mask bit is set to 1.

Resetting Down Line Load Area

Issuing the command ESC+=+0+0 initializes the download area. All previously downloaded characters are cleared and the Index Tables are loaded with information for resident fonts.

Programming Examples:

To load the draft character used in the example for the Epson LQ-2500 mode (Greek gamma), the following program may be used.

```
10 REM Greek Gamma Character Download and print
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 REM---(Initialize the Download Buffer)
50 PRINT #1,CHR$(27)+"="+CHR$(0)+CHR$(0);
60 REM---(Dot Pattern Data Entry to ASCII "A")
70 PRINT #1,CHR$(27)+"="+CHR$(30)+CHR$(0)+CHR$(35);
80 PRINT #1,CHR$(&H0)+CHR$(&HB0);
90 PRINT #1,CHR$(0)+CHR$(128)+CHR$(0);
100 PRINT #1,CHR$(1)+CHR$(0)+CHR$(0);
110 PRINT #1,CHR$(0)+CHR$(128)+CHR$(0);
120 PRINT #1,CHR$(0)+CHR$(65)+CHR$(64);
130 PRINT #1,CHR$(0)+CHR$(18)+CHR$(16);
140 PRINT #1,CHR$(0)+CHR$(5)+CHR$(64);
150 PRINT #1,CHR$(0)+CHR$(16)+CHR$(0);
160 PRINT #1,CHR$(1)+CHR$(64)+CHR$(0);
170 PRINT #1,CHR$(0)+CHR$(0)+CHR$(0);
180 REM---(Index Table Entry to ASCII "A")
190 PRINT #1,CHR$(27)+"="+CHR$(12)+CHR$(0)+CHR$(35);
200 PRINT #1,CHR$(&H5A)+CHR$(&H82);
210 PRINT #1,CHR$(&HB0)+CHR$(&H0)+CHR$(8);
220 PRINT #1,CHR$(10)+CHR$(0)+CHR$(0);
230 PRINT #1,CHR$(0)+CHR$(0)+CHR$(0);
240 REM---(Download Character print)
250 PRINT #1,CHR$(27)+"I"+CHR$(4);
260 FOR I=1 TO 10
270 PRINT #1,"A";
280 NEXT
290 PRINT #1,CHR$(13);CHR$(10);
300 CLOSE #1
310 END
```

In this example of Greek gamma, a character is not compressed and data of CM_1 through CM_5 are all zeros.

To load the LQ character used in the example for the one-eighth-note character, the following program may be used.

Input format is the same as with draft fonts.

Programming example for the one-eighth-note character is as follows:

```
10 REM One-eighth-note Character Download and print
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 REM---(Initialize the Download Buffer)
50 PRINT #1,CHR$(27)+"="+CHR$(0)+CHR$(0);
60 REM---(Dot Pattern Data Entry to ASCII "B")
70 PRINT #1,CHR$(27)+"="+CHR$(45)+CHR$(0)+CHR$(35);
80 PRINT #1,CHR$(&H0)+CHR$(&HB0);
90 PRINT #1,CHR$(0)+CHR$(0)+CHR$(0);
100 PRINT #1,CHR$(0)+CHR$(0)+CHR$(128);
110 PRINT #1,CHR$(0)+CHR$(1)+CHR$(64);
120 PRINT #1,CHR$(0)+CHR$(3)+CHR$(224);
130 PRINT #1,CHR$(0)+CHR$(7)+CHR$(240);
140 PRINT #1,CHR$(0)+CHR$(3)+CHR$(224);
150 PRINT #1,CHR$(0)+CHR$(1)+CHR$(64);
160 PRINT #1,CHR$(63)+CHR$(254)+CHR$(128);
170 PRINT #1,CHR$(14)+CHR$(0)+CHR$(0);
180 PRINT #1,CHR$(6)+CHR$(0)+CHR$(0);
190 PRINT #1,CHR$(3)+CHR$(0)+CHR$(0);
200 PRINT #1,CHR$(1)+CHR$(132)+CHR$(0);
210 PRINT #1,CHR$(0)+CHR$(120)+CHR$(0);
220 PRINT #1,CHR$(0)+CHR$(0)+CHR$(0);
230 REM---(Index Table Entry to ASCII "B")
240 PRINT #1,CHR$(27);"=";CHR$(12)+CHR$(0)+CHR$(35);
250 PRINT #1,CHR$(&H64)+CHR$(&H8B);
260 PRINT #1,CHR$(&HB0)+CHR$(&H0)+CHR$(14);
270 PRINT #1,CHR$(35)+CHR$(124)+CHR$(90);
280 PRINT #1,CHR$(85)+CHR$(47)+CHR$(240);
290 REM---(Download Character print)
300 PRINT #1,CHR$(27);"I";CHR$(6);
310 FOR I=1 TO 10
320 PRINT #1,"B";
330 NEXT
340 PRINT #1, CHR$(13);CHR$(10);
350 CLOSE #1
360 END
```

Notes:

- The left most column of adjacent identical columns has its compression mask bit set to 0 and that bit in the other such columns is set to 1.
- Entry data can designate any character data image whether resident or downloaded. Multiple table entries can designate the same character. The address of an undefined entry should be 000. An undefined entry is printed as a space.
- Location 0 (00_{HEX}) normally stores the slashed zero. If a character is downloaded into this location, when the slashed zero is selected in the Initial Setup mode, the downloaded character will print in place of any zero.
- ASCII character in location 255 (FF_{HEX}) cannot be defined.

5.3 Bit Image (Graphics)

Bit image (Graphics) is used to produce pictures, graphs, charts or creative patterns. Many commercial software packages use bit images. This printer has six 8-pin bit image modes and five 24-pin bit image modes within LQ-2500 mode, and has four 8-pin/24-pin bit image modes within IBM Proprinter X24 mode, so that you have a wide variety of image printing. When you use a commercial software package you should refer to your software instruction manual for the proper use of it with this printer. Each printer mode has its own bit image commands. Because differences between the two modes are small, only LQ-2500 mode is used here as an example of how to print bit images through software commands.

Dot Density

Dot density (dot resolution) refers to the maximum number of dots which can be printed in an inch or on a line. This printer enables you to access a variety of dot densities through specific control commands. The various dot densities and corresponding control commands appear in Table 5.1.

Command	Function	Dots/inch	Dots/line
ESC+K+n_1+n_2	Standard density	60	480
ESC+L+n_1+n_2	Double density	120	960
ESC+Y+n_1+n_2	Double speed, Double density	120	960
ESC+Z+n_1+n_2	Quadruple density	240	1920
ESC+*+m+n_1+n_2	8-Pin Mode Selection:		
	m=0 (Standard)	60	480
	m=1 (Double)	120	960
	m=2 (Double speed, Double density)	120	960
	m=3 (Quadruple density)	240	1920
	m=4 (CRT I)	80	640
	m=6 (CRT II)	90	720
	24-Pin Mode Selection:		
	m=32 (Standard)	60	480
	m=33 (Double)	120	960
	m=38 (CRT III)	90	720
	m=39 (Triple)	180	1440
	m=40 (Hex)	360	2880
ESC+[+g+n_1 +n_2+m	8-Pin Mode Selection:		
	m=0 (Standard)	60	480
	m=1 (Double)	120	960
	m=2 (Double speed, Double density)	120	960
	m=3 (Quadruple density)	240	1920
	24-Pin Mode Selection:		
	m=8 (Standard)	60	480
	m=9 (Double)	120	960
	m=11 (Triple)	180	1440
	m=12 (Hex)	360	2880

Table 5.1 Dot Density

8-Pin Bit Image Mode

This printer has 24 pins in the print head. The distance between the centers of adjacent pins 1/180″ (0.14 mm) and the diameter of each pin is 1/127″ (0.2 mm). In 8-pin bit image mode the 24 pins of the print head are grouped as follows. One byte is sent to the printer for each column to be printed. Each bit of that byte represents an individual pin-block. By summing the powers of two corresponding to each pin-block you wish to fire, you will obtain a numerical value for the column in question. By sending a string of bytes, numerical values for each column on a line are input and processed. The result is one line of graphics.

Pin-Block	Pin-block Code
1	$2^7=128$
2	$2^6=64$
3	$2^5=32$
4	$2^4=16$
5	$2^3=8$
6	$2^2=4$
7	$2^1=2$
8	$2^0=1$

LQ-2500 mode and
IBM Proprinter X24 mode
(Alternate Graphic Mode: ON)

Pin No.	Pin-block Code	Pin-block
1	$2^7=128$	1
2		
3		1 and 2
4	$2^6=64$	2
5		
6	$2^5=32$	3
7		
8		3 and 4
9	$2^4=16$	4
10		
11	$2^3=8$	5
12		
13		5 and 6
14	$2^2=4$	6
15		
16	$2^1=2$	7
17		
18		7 and 8
19	$2^0=1$	8
20		
21	Not used	
22		
23		
24		

IBM Proprinter X24 mode
(Alternate Graphic Mode: OFF)

Note:
In the LQ-2500 mode or IBM Proprinter X24 mode, when Alternate Graphic Mode (AGM) is set to ON in the Initial Setup mode, 8-pin bit image graphics is printed by using all 24 pins in the print head.

As an example, suppose you want to fire pin-blocks 1, 2, 5 and 8 simultaneously. Then you complete the following sum:

Input code=Pin-block 1 code+Pin-block 2 code+Pin-block 5 code+ Pin-block 8 code
$=2^7+2^6+2^3+2^0=128+64+8+1=201$

Thus, the value 201 is entered in the CHR$ function in order to print a single column of dots resulting from firing pin-blocks 1, 2, 5 and 8.

For our final example, refer to the standard density designation in Table 5.1. This setting is given by ESC+K+n_1+n_2. Suppose you wish to print 100 columns of dots, where every column fires pins 1 and 8 only. You first compute the values of n_1 and n_2 which define the number of columns to be printed.

$$256\overline{)\ 100}\ \ 0\ (n_2)$$
$$\underline{\ \ 0\ \ }$$
$$100\ (n_1)$$

, so $n_2=0$ and $n_1=100$

Our control code ESC+K+n_1+n_2 now translates into:

```
LPRINT CHR$(27)+"K"+CHR$(100)+CHR$(0);
```

If you use ESC+[+g+n_1+n_2+m of IBM Proprinter X24 mode, compute the values of n_1 and n_2 is as follows:

$n_2\times256+n_1$=Column×Bytes+1

m=0, 1, 2, 3: Bytes=1
m=8, 9, 11, 12: Bytes=3

For example, 24-pin bit image of 100 column is:

$100\times3+1$, so $n_2=1$ and $n_1=45$.

A programming example is as follows:

```
10 REM STANDARD DENSITY
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT #1,CHR$(27)+"3"+CHR$(24);
50 PRINT #1,CHR$(27)+"K"+CHR$(100)+CHR$(0);
60 FOR I=1 TO 5
70 PRINT #1,CHR$(1)+CHR$(2)+CHR$(4)+CHR$(8)+CHR$(16);
80 PRINT #1,CHR$(32)+CHR$(64)+CHR$(128)+CHR$(64)+CHR$(128);
90 PRINT #1,CHR$(64)+CHR$(128)+CHR$(64)+CHR$(128)+CHR$(64);
100 PRINT #1,CHR$(32)+CHR$(16)+CHR$(8)+CHR$(4)+CHR$(2);
110 NEXT I
120 PRINT #1,CHR$(13);CHR$(10);
130 PRINT #1,CHR$(27)+"K"+CHR$(100)+CHR$(0);
140 FOR I=1 TO 5
150 PRINT #1,CHR$(128)+CHR$(64)+CHR$(32)+CHR$(16)+CHR$(8);
160 PRINT #1,CHR$(4)+CHR$(2)+CHR$(1)+CHR$(2)+CHR$(1);
170 PRINT #1,CHR$(2)+CHR$(1)+CHR$(2)+CHR$(1)+CHR$(2);
180 PRINT #1,CHR$(4)+CHR$(8)+CHR$(16)+CHR$(32)+CHR$(64);
190 NEXT I
200 PRINT #1,CHR$(13);CHR$(10);
210 CLOSE
220 END
```

24/180" Line space set

1st line data

2nd line data

Notes:

- Line 20 and 30 are necessary for the proper execution of this program on many IBM-compatible computers.
- Line 40 is necessary to set the line feed for printing in the bit image mode. In the IBM Proprinter X24 mode, when AGM is set to OFF in the Initial Setup mode, it will amount to 24/216 inch.

24-Pin Bit Image Mode

In the 24-pin bit image mode, all 24 pins of the print head may be fired. In this mode, 3 data bytes must be sent to the printer for each column. The 24 pins in the print head are divided into three portions, the upper 8 pins, middle 8 pins and lower 8 pins.
As an example, suppose you want to fire pins 1, 2, 5, 8, 9, 11, 12, 21 and 24 simultaneously. Then you determine the following three values:

Byte 1: Input code=Pin 1 code+Pin 2 code+Pin 5 code+Pin 8 code
$=2^7+2^6+2^3+2^0=128+64+8+1=201$
Byte 2: Input code=Pin 9 code+Pin 11 code+Pin 12 code
$=2^7+2^5+2^4=128+32+16=176$
Byte 3: Input code=Pin 21 code+Pin 24 code=$2^3+2^0=8+1=9$

Thus, the three bytes for a single column of dots are entered as CHR$(201);CHR$(176);CHR$(9); Refer to the 24-pin standard density command in Table 5-1. This setting is given by ESC+*+m+n_1+n_2, where m=32. Suppose you wish to print 100 columns of dots, where every column fires pins 1, 2, 5, 8, 9, 11, 12, 21 and 24 as above.

As in the 8-pin example on page 5-18, n_1=100 and n_2=0. Our command ESC+*+m+n_1+n_2 now translates into
LPRINT CHR$(27)+"*"+CHR$(32)+CHR$(100)+CHR$(0);
If we incorporate this information into a program, we might have the following:

```
10 REM 24 PIN STANDARD DENSITY
20 WIDTH "LPT1:",255
30 OPEN "LPT1:" AS #1
40 PRINT #1,CHR$(27)+"*"+CHR$(32)+CHR$(100)+CHR$(0);
50 FOR I=1 TO 100
60 PRINT #1,CHR$(201);
70 PRINT #1,CHR$(176);
80 PRINT #1,CHR$(9);
90 NEXT I
100 PRINT #1,CHR$(10);
110 CLOSE
120 END
```

If you use ESC+[+g+n_1+n_2+m in IBM Proprinter X24 mode, you must change line 40 as follows:
40 PRINT #1, CHR$(27)+"[g"+CHR$(45)+CHR$(1)+CHR$(8);

Notes:
- Bit Image Graphics prints unidirectionally for high precision printing. For high speed printing set the printer to bidirectional.
- Graphics mode is released immediately following the printing of all bit image data. Printing will return to text mode.
- Bit image data is not affected by MSB control commands.

Alternate Graphic Mode (AGM)

There are two kinds of graphic printing in IBM Proprinter X24 mode. You can set them through Alternate Graphic Mode setting in the Initial Setup mode or through software.

When AGM is set to OFF, 8-pin bit image graphic is printed by using pins 1 through 20.

When Alternate Graphic Mode is set to ON, the printing of 8-pin Graphic mode is the same as in Epson LQ-2500 mode. Also, graphic printing command, ESC+* in Epson LQ-2500 mode is effective in this mode. Therefore, you can use the same command as in Epson LQ-2500 mode.

The following table shows commands affected by AGM mode.

<table>
<tr><th colspan="2"></th><th>AGM ON</th><th>AGM OFF</th></tr>
<tr><td colspan="2">ESC+K+n_1+n_2
ESC+L+n_1+n_2
ESC+Y+n_1+n_2
ESC+Z+n_1+n_2</td><td>use 24 pin</td><td>use 20 pin</td></tr>
<tr><td rowspan="2">ESC+[+g+n_1+n_2+m</td><td>8-Pin mode</td><td rowspan="2">use 24 pin</td><td>use 20 pin</td></tr>
<tr><td>24-Pin mode</td><td>use 24 pin</td></tr>
<tr><td colspan="2">ESC+3+n
ESC+A+n
ESC+J+n</td><td>based on n/180 inch
based on n/60 inch
based on n/180 inch</td><td>based on n/216 inch
based on n/72 inch
based on n/216 inch</td></tr>
</table>

6. Epson LQ-2500 Mode Commands

This chapter covers software commands of Epson LQ-2500 mode. The software commands are grouped into the following classifications:

FONT SELECTION

Name	Function	Page
ESC+x+n	Selects print letter quality	6-6
ESC+k+n	Selects print font style	6-6
ESC+S+0	Select superscript printing	6-7
ESC+S+1	Selects subscript printing	6-7
ESC+T	Releases sub/superscript printing	6-7

CHARACTER PITCH SELECTION

Name	Function	Page
ESC+P	Sets pica pitch (10 cpi) printing	6-7
ESC+M	*Sets elite pitch (12 cpi) printing	6-7
ESC+g	Sets micron (15 cpi) printing	6-8
SI	*Sets compressed (17 cpi) printing	6-8
ESC+SI	*Sets compressed (17 cpi) printing	6-8
DC2	Releases compressed printing	6-8
ESC+p+1	Sets proportional spacing	6-9
ESC+p+0	Releases proportional spacing	6-9
ESC+!+n	Sets certain pitches based upon value of n	6-9

*When 12 cpi and compressed pitch are set simultaneously, subsequent output is printed in 20 cpi (160 cpl).

CHARACTER HIGHLIGHT SELECTION

Name	Function	Page
ESC+!+n	Sets highlighting based upon value of n	6-9
ESC+E	Sets emphasized printing	6-10
ESC+F	Releases emphasized printing	6-10
ESC+w+1	Sets double high printing	6-10
ESC+w+0	Releases double high printing	6-10
DC4	Releases single-line double width printing	6-10
SO	Sets single-line double width printing	6-10
ESC+SO	Sets single-line double width printing	6-10
ESC+W+1	Sets double width printing	6-11
ESC+W+0	Releases double width printing	6-11

CHARACTER HIGHLIGHT SELECTION

Name	Function	Page
ESC+G	Sets double strike printing	6-11
ESC+H	Releases double strike printing	6-11
ESC+−+1	Sets underlining	6-11
ESC+−+0	Releases underlining	6-11

WORD PROCESSING MODE SELECTION

Name	Function	Page
ESC+a+0	Releases Word Processing mode	6-12
ESC+a+1	Selects centering mode	6-12
ESC+a+2	Selects right alignment mode	6-12
ESC+a+3	Selects justification mode	6-12
ESC+SP+n	Sets character dots spacing	6-12

CHARACTER SETS SELECTION

Name	Function	Page
ESC+4	Sets Italic printing	6-12
ESC+5	Releases Italic printing	6-12
ESC+R+n	Sets international character set	6-13
ESC+6	Selects IBM character set 2	6-13
ESC+7	Selects IBM character set 1	6-13
ESC+t+n	Selects alternate character set	6-14

BIT IMAGE (GRAPHICS) MODE SELECTION

Name	Function	Page
ESC+K+n_1+n_2	Sets 8 pin image standard density (60 dpi)	6-14
ESC+L+n_1+n_2	Sets 8 pin image double density (120 dpi)	6-14
ESC+Y+n_1+n_2	Sets 8 pin image double density double speed (120 dpi)	6-14
ESC+Z+n_1+n_2	Sets 8 pin bit image quadruple density (240 dpi)	6-15
ESC+*+m+n_1+n_2	Sets bit image mode selection (8 pin 60, 120, 120D, 240, 80, 90, 24 pin 60, 120, 90, 180, 360)	6-15
ESC+?+n+m	Reassigns graphics mode density	6-16

PAPER FEED SELECTION—Amount

Name	Function	Page
ESC+0	Sets paper feed to 1/8 inch (3.2 mm)	6-16
ESC+2	Sets paper feed to 1/6 inch (4.2 mm)	6-17
ESC+A+n	Sets paper feed to n/60 inch	6-17
ESC+3+n	Sets paper feed to n/180 inch	6-17
ESC+++n	Sets paper feed to n/360 inch	6-18
FS+3+n	Sets paper feed to n/360 inch	6-18

PAPER FEED SELECTION—Execution

Name	Function	Page
LF	Feeds paper one line	6-18
FF	Feeds paper to next top of form position	6-19
ESC+J+n	Executes one-line paper feed of n/180 inch	6-19
ESC+j+n	Executes one-line reverse paper feed of n/180 inch	6-20

PAGE FORMAT CONTROL

Name	Function	Page
ESC+C+0+n	Sets page length in inches	6-20
ESC+C+n	Sets page length in lines	6-21
ESC+l+n	Sets left margin	6-21
ESC+Q+n	Sets right margin	6-22
ESC+N+n	Sets skip perforation	6-22
ESC+O	Releases skip perforation	6-22

TABULATION—Horizontal

Name	Function	Page
ESC+D+n_1+... +n_x+0	Sets horizontal tab	6-23
ESC+D+0	Releases horizontal tab	6-23
HT	Executes horizontal tab	6-23

TABULATION—Vertical

Name	Function	Page
ESC+B+n_1+... +n_x+0	Sets vertical tab	6-24
ESC+B+0	Releases vertical tab	6-24
VT	Executes vertical tab	6-24
ESC+/+n	Sets VFU channel	6-25
ESC+b+m+n_1+... +n_x+0	Sets VFU tabulation	6-25
ESC+b+m+0	Releases VFU tabulation	6-25

CARRIAGE CONTROL

Name	Function	Page
BS	Prints, then backspaces one character	6-26
CR	Prints a line, then returns carriage	6-26
ESC+<	Homes the print head	6-26
ESC+U+1	Sets single direction printing	6-27
ESC+U+0	Releases single direction printing	6-27
ESC+s+1	Sets half speed printing	6-27
ESC+s+0	Releases half speed printing	6-27
ESC+\+n_1+n_2	Moves the printhead to a relative horizontal position	6-27
ESC+$+$n_1$+$n_2$	Moves the printhead to an absolute horizontal position	6-28

DATA CONTROL

Name	Function	Page
CAN	Clears data in buffer	6-28
DC1	Selects printer remotely	6-28
DC3	Deselects printer remotely	6-28
DEL	Deletes last printable character	6-29
ESC+>	Sets MSB on	6-29
ESC+=	Sets MSB off	6-29
ESC+#	Cancels MSB setting	6-30

DOWN LINE LOAD CHARACTER SELECTION

Name	Function	Page
ESC+&+0+n+m	Defines download font	6-30
ESC+%+0	Selects ROM CG	6-31
ESC+%+1	Selects download CG	6-31
ESC+:+0+0+0	Copies internal ROM CG font into download CG	6-31

MISCELLANEOUS

Name	Function	Page
BEL	Sounds the buzzer	6-31
ESC	First byte of multi-byte control codes	6-32
NUL	Last byte of certain multi-byte control codes	6-32
ESC+@	Initializes the printer	6-32
ESC+EM+n	Cut Sheet Feeder control	6-33

LETTER QUALITY (LQ) FONT:

Selects letter quality font printing.

Name:	ESC+x+n	(n=0, 1)
Dec.:	27, 120, n	
Hex.:	1B, 78, n	

Comments:

- This command sets letter quality printing in whichever pitch is set at the time.
- Sub/superscript characters can be printed in the letter quality font.
- The following values of n can be used.
  - n=1: LQ
  - n=0: Draft
- This command is operational only when the Font is set to "PGM" on the Control Table.

FONT STYLE:

Selects font style.

Name:	ESC+k+n	(n=0, 1, 2, 3, 4)
Dec.:	27, 107, n	
Hex.:	1B, 6B, n	

Comments:

- The following values can be used.
  - n=0: Courier font
  - n=1: Sans Serif font
  - n=2: Courier font
  - n=3: Prestige font
  - n=4: Script font
  - n=6: Bold PS font
- This command is operational only when the Font is set to "PGM" on Control Table.
- This command is effective in letter quality mode (ESC+x+1).

SUB/SUPERSCRIPT FONT:

Selects sub/superscript font with characters printed on the bottom/top 2/3 area of the line.

Name:	Set: ESC+S+n (subscript: n=1 / superscript: n=0)	Release: ESC+T
Dec.:	27, 83, n	27, 84
Hex.:	1B, 53, n	1B, 54

Comments:

- Sub/superscript characters are 2/3 normal height.
- In PS mode, font and pitch are reduced to 2/3 their original width. In the other modes, font is reduced to 2/3 their original width and pitch is normal width. Refer to Appendix B.
- In draft mode, characters are normal width.

PICA PITCH:

Sets printing to 10 characters per inch (80 characters per line).

Name:	ESC+P
Dec.:	27, 80
Hex.:	1B, 50

Comments:

- This command is operational only when the PITCH is set to "PGM" on the Control Table.
- When pica and compressed are set simultaneously subsequent output is 17 cpi (137 cpl).

ELITE PITCH:

Sets printing to 12 characters per inch (96 characters per line).

Name:	ESC+M
Dec.:	27, 77
Hex.:	1B, 4D

Comments:

- This command is operational only when the PITCH is set to "PGM" on the Control Table.
- When elite and compressed are set simultaneously subsequent output is 20 cpi (160 cpl).

MICRON PITCH:

Sets printing to 15 characters per inch (120 characters per line).

Name: ESC+g
Dec.: 27, 103
Hex.: 1B, 67

Comments:

- This command is operational only when the PITCH is set to "PGM" on the Control Table.
- When micron and compressed are set simultaneously subsequent output is 15 cpi (120 cpl).

COMPRESSED PITCH:

Sets printing to 17 characters per inch (137 characters per line).

Name:	Set: SI or ESC+SI	Release: DC2
Dec.:	15 or 27, 15	18
Hex.:	0F or 1B, 0F	12

Comments:

- This command is operational only when the PITCH is set to "Pgm" in the Control Table.
- When pica and compressed are set simultaneously subsequent output is 17 cpi (137 cpl).
- When elite and compressed are set simultaneously subsequent output is 20 cpi (160 cpl).
- When micron and compressed are set simultaneously subsequent output is 15 cpi (120 cpl).

PROPORTIONAL SPACING:

Sets proportional spacing between characters.

Name:	Set:	ESC+p+1	Release:	ESC+p+0
Dec.:		27, 112, 1		27, 112, 0
Hex.:		1B, 70, 01		1B, 70, 00

Comments:

- If proportional spacing is set together with pica, elite, micron or compressed pitch, subsequent output is printed in proportional spacing.
- This command is operational only when the PITCH is set to "PGM" on the Control Table.
- This command is ineffective when the font is set to "DRAFT" in the Control Table.

PROGRAMMABLE PITCH/HIGHLIGHTING:

Sets a combination of character pitch and/or highlighting.

Name:	ESC+!+n	(0≦n≦255)
Dec.:	27, 33, n	
Hex.:	1B, 21, n	

Comments:

- Print modes correspond to the setting of each bit as illustrated below.

bit	7 (msb)	6	5	4	3	2	1	0 (lsb)
"1"	Under-lining	Italic	Double width	Double printing	Empha-sized	Com-pressed	PS	Elite
"0"	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Pica

- Bits 0,1 and 2 only pertain to pitch.
- If n=49 (31_{HEX}), bits 0,4 and 5 are set to "1" producing double width, elite double printing.
- Pitch and highlight combinations are determined by the value of "n".
- Compressed, pica, elite and proportional spacing pitch are operational only when the PITCH is set to "PGM" on the Control Table.
- Invalid values of "n" follow rules noted in individual commands.

EMPHASIZED PRINTING:

Sets printing to twice the original horizontal dot density.

Name:	Set: ESC+E	Release: ESC+F
Dec.:	27, 69	27, 70
Hex.:	1B, 45	1B, 46

Comment:

- Emphasized characters are printed at half speed (100 cps in draft pica pitch).

DOUBLE HIGH PRINTING:

Sets double high printing.

Name:	Set: ESC+w+1	Release: ESC+w+0
Dec.:	27, 119, 1	27, 119, 0
Hex.:	1B, 77, 01	1B, 77, 00

Comments:

- Sub/superscript and compressed modes are not valid in the double high printing mode.
- ESC+!+n can also be used to release (see Programmable Pitch for valid "n" values).

DOUBLE WIDTH PRINTING—SINGLE LINE:

Sets double width (elongated) character printing for one line only.

Name:	Set: SO or ESC+SO	Release: DC4 or ESC+W+0
Dec.:	14 or 27, 14	20 or 27, 87, 0
Hex.:	0E or 1B, 0E	14 or 1B, 57, 00

Comment:

- Single-line double width printing is released when:
  - —a CR, LF, FF or VT is executed.
  - —the printer is initialized.
  - —DC4 or ESC+W+0 is executed.
  - —ESC+!+0 is executed.

DOUBLE WIDTH PRINTING:

Sets double width (elongated) character printing.

Name:	Set:	ESC+W+1	Release:	ESC+W+0
Dec.:		27, 87, 1		27, 87, 0
Hex.:		1B, 57, 01		1B, 57, 00

Comment:

- Double width printing set by ESC+W+1 is only released by ESC+W+0 or ESC+!+n (see Programmable Pitch for valid "n" values).

DOUBLE STRIKE PRINTING:

Sets double strike printing:

Name:	Set:	ESC+G	Release:	ESC+H
Code:		27, 71		27, 72
Hex.:		1B, 47		1B, 48

Comment:

- Double Strike Printing sets printing of each line of data with two passes of the print head, feeding the paper 1/180″ (0.14 mm) between the first and second pass.

UNDERLINING:

Sets continuous underlining of characters.

Name:	Set:	ESC+−+1	Release:	ESC+−+0
Dec.:		27, 45, 1		27, 45, 0
Hex.:		1B, 2D, 01		1B, 2D, 00

Comments:

- Bit image data, spaces set by the HT code and IBM graphic characters are not underlined.
- Whenever two passes of the print head are required, underline is printed only on the first pass.

WORD PROCESSING MODE SELECTION:

Selects word processing mode.

Name:	ESC+a+n	(n=0, 1, 2, 3)
Dec.:	27, 97, n	
Hex.:	1B, 61, n	

Comment:

- The following values can be used.
  - n=0: Releases Word Processing mode.
  - n=1: Selects centering mode.
  - n=2: Selects right alignment mode.
  - n=3: Selects justification mode.

CHARACTER DOT SPACING:

Sets character dot spacing until changed.

Name:	ESC+SP+n	(0≦n≦127)
Dec.:	27, 32, n	
Hex.:	1B, 20, n	

Comments:

- Sets the amount of dot space (Draft: n/120 inch, LQ: n/180 inch) added to the right of each character.
- This command allows microjustification.

ITALIC FONT:

Selects italic character printing.

Name:	Set:	ESC+4	Release:	ESC+5
Dec.:		27, 52		27, 53
Hex.:		1B, 34		1B, 35

Comments:

- Italic characters in locations 160_{DEC}~254_{DEC} ($A0_{HEX}$~FE_{HEX}) are printed in place of characters in locations 32_{DEC}~126_{DEC} (20_{HEX}~$7E_{HEX}$).
- Italic characters can only be printed with the printer in the Epson Italic character set.

INTERNATIONAL CHARACTER SET:

Selects any one of 13 international character sets.

Name: ESC+R+n (0≦n≦12)
Dec.: 27, 82, n
Hex.: 1B, 52, n

Comments:
- Appendix A illustrates allocation of international characters to their respective locations.
- International character sets can be set with Initial Setup mode.

IBM CHARACTER SET I:

Selects IBM Proprinter character set 1.

Name: ESC+7
Dec.: 27, 55
Hex.: 1B, 37

Comments:
- Refer to Appendix A.
- This command is operational only when IBM Graphics is selected by ESC+t+1.

IBM CHARACTER SET II:

Selects IBM Proprinter character set 2.

Name: ESC+6
Dec.: 27, 54
Hex.: 1B, 36

Comments:
- Refer to Appendix A.
- This command is operational only when IBM Graphics is selected by ESC+t+1.

ALTERNATE CHARACTER SET:

Selects alternate character set.

Name: ESC+t+n (n=0, 1)
Dec.: 27, 116, n
Hex.: 1B, 74, n

Comment:
- The following values of n can be used.
  n=0: Italic
  n=1: Graphic Character Set

8-PIN STANDARD DENSITY GRAPHICS:

Sets standard density graphics mode [480 dots per line/60 dots per inch (25.4 mm)].

Name: ESC+K+n_1+n_2+Data
Dec. 27, 75, n_1, n_2, Data
Hex.: 1B, 4B, n_1, n_2, Data

8-PIN DOUBLE DENSITY GRAPHICS:

Sets double density graphics mode [960 dots per line/120 dots per inch (25.4 mm)].

Name: ESC+L+n_1+n_2+Data
Dec. 27, 76, n_1, n_2, Data
Hex.: 1B, 4C, n_1, n_2, Data

8-PIN DOUBLE SPEED/DOUBLE DENSITY GRAPHICS:

Sets double speed, double density graphics mode [960 dots per line/120 dots per inch (25.4 mm)].

Name: ESC+Y+n_1+n_2+Data
Dec.: 27, 89, n_1, n_2, Data
Hex.: 1B, 59, n_1, n_2, Data

Comment:
- Horizontally adjacent dots cannot be printed.

8-PIN QUADRUPLE DENSITY GRAPHICS:

Sets quadruple density graphics mode [1920 dots per line/240 dots per inch (25.4 mm)].

Name: ESC+Z+n_1+n_2+Data
Dec.: 27, 90, n_1, n_2, Data
Hex.: 1B, 5A, n_1, n_2, Data

Comment:
- Horizontally adjacent dots cannot be printed.

BIT IMAGE MODE SELECTION:

Selects one of 8-pin and 24-pin bit image graphic modes.

Name: ESC+*+m+n_1+n_2+Data
(m=0, 1, 2, 3, 4, 6, 32, 33, 38, 39, 40)
Dec.: 27, 42, m, n_1, n_2, Data
Hex.: 1B, 2A, m, n_1, n_2, Data

Comments:
- The following table illustrates the various modes based upon the values of m.

m	Pin	Dots/Inch	Dots/Line	
0	8	60	480	Standard Density
1	8	120	960	Double Density
2	8	120	960	Double Speed, Double Density
3	8	240	1920	Quadruple Density
4	8	80	640	CRT I
6	8	90	720	CRT II
32	24	60	480	Standard Density
33	24	120	960	Double Density
38	24	90	720	CRT III
39	24	180	1440	Triple Density
40	24	360	2880	Hex Density

- When m=2, 3, 40, Horizontal adjacent dots cannot be printed.

BIT IMAGE MODE REASSIGNMENT:

Reassigns bit image graphics mode density.

Name: ESC+?+n+m+Data
(n=75, 76, 89, 90 m=0, 1, 2, 3, 4, 6, 32, 33, 38, 39, 40)
Dec.: 27, 63, n, m, Data
Hex.: 1B, 3F, n, m, Data

Comments:

- The value of "n" specifies the graphics mode which is to be reassigned:
  n=75: Reassign Standard Density (ESC+K+n_1+n_2)
  n=76: Reassign Double Density (ESC+L+n_1+n_2)
  n=89: Reassign Double Speed, Double Density (ESC+Y+n_1+n_2)
  n=90: Reassign Quadruple Density (ESC+Z+n_1+n_2)
- The value of "m" specifies the graphics mode to which the original is to be reassigned. Refer to Table 5.1 on page 5-15.

1/8 INCH PAPER FEED:

Sets paper feed amount to 1/8 inch (3.2 mm).

Name: ESC+0
Dec.: 27, 48
Hex.: 1B, 30

1/6 INCH PAPER FEED:

Sets paper feed amount to 1/6 inch (4.2 mm).

Name: ESC+2
Dec.: 27, 50
Hex.: 1B, 32

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n/60 INCH PAPER FEED:

Sets programmable paper feed amount to n/60 inch.

Name: ESC+A+n
Dec.: 27, 65, n
Hex.: 1B, 41, n

Comment:
- n/60 inch paper feed is valid for $0 \leqq n \leqq 85$.

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n/180 INCH PAPER FEED:

Sets programmable paper feed amount to n/180 inch.

Name: ESC+3+n
Dec.: 27, 51, n
Hex.: 1B, 33, n

Comment:
- n/180 inch paper feed is valid for $0 \leqq n \leqq 255$.

n/360 INCH PAPER FEED:

Sets programmable paper feed amount to n/360 inch.

Name:	ESC+++n	FS+3+n
Dec.:	27, 43, n	28, 51, n
Hex.:	1B, 2B, n	1C, 33, n

Comment:

- n/360 inch paper feed is valid for $0 \leqq n \leqq 255$.

LINE FEED (LF):

Causes data in buffer to be printed and then excutes single line feed.

Name:	LF
Dec.:	10
Hex.:	0A

Comments:

- When the new line position falls within the perforation skip area, the paper advances to the next top of form position if skip over perforation is turned on.
- If there is no data, "space" data (ASCII 32), or blanks between HT print positions in the buffer, LF feeds the paper 1 line.
- The amout of spacing generated by LF is a function of the paper feed amount setting.
- LF code releases single-line double width printing set by SO or ESC+SO.

FORM FEED (FF):

Feeds paper to next top of form position after first printing any data in the buffer.

Name: FF
Dec.: 12
Hex.: 0C

Comments:
- FF releases single-line double width printing set by SO or ESC+SO.
- Amount of form feed depends upon page length set by the page length control command or the EZ Set Operator panel.

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n/180 INCH PAPER FEED:

Prints out the data in the print buffer and feeds the paper n/180 inch.

Name: ESC+J+n
Dec.: 27, 74, n
Hex.: 1B, 4A, n

Comments:
- Single-line, n/180inch paper feed is valid for $0 \leqq n \leqq 255$.
- This command sets the paper feed for ONE line only. The carriage does not return to the left margin position. Instead, printing of next line begins where previous printing left off.
- This command does not release single-line double width printing set by SO or ESC+SO.

n/180 INCH REVERSE DIRECTION SINGLE LINE PAPER FEED:

Prints out the data in the print buffer and feeds the paper n/180 inch in reverse direction.

Name: ESC+j+n
Dec.: 27, 106, n
Hex.: 1B, 6A, n

Comments:
- Reverse, single line n/180inch paper feed is valid for $0 \leqq n \leqq 255$.
- This command sets reverse direction paper feed for one line only. The carriage will not return to the left margin position. Instead, the printing of the next line begins where the previous printing left off.
- This command does not release single-line double width printing set by SO or ESC+SO.

Notes:
- Reverse paper feed cannot be executed in the area within 3.6 inches (91.4 mm) of the bottom perforation. Additionally, the perforation should not be included in the area of reverse paper feed.
- Multi-part forms should not be used with reverse paper feed.

PAGE LENGTH (INCHES):

Sets page length in inches.

Name: ESC+C+0+n
Dec.: 27, 67, 0, n
Hex.: 1B, 43, 00, n

Comments:
- Upon receipt of ESC+C+0+n, the present line position becomes the top of page position.
- The value of n must be in the range $0 \leqq n \leqq 22$.
- ESC+C+0+n releases the skip perforation settings.
- The page length does not change even if the paper feed amount is changed.
- The terms "form" and "page" are interchangeable.

PAGE LENGTH (LINES):

Sets page length in number of lines.

Name: ESC+C+n
Dec.: 27, 67, n
Hex.: 1B, 43, n

Comments:

- Upon receipt of ESC+C+n, the present line position becomes the top of page position.
- The value of n must be in the range $1 \leqq n \leqq 127$. If n=0, page length returns to the inch designation.
- ESC+C+n releases the skip perforation settings.
- The page length does not change even if the paper feed amount is changed.
- The terms "form" and "page" are interchangeable.

LEFT MARGIN:

Sets position of left margin.

Name: ESC+l+n
Dec.: 27, 108, n
Hex.: 1B, 6C, n

Comments:

- If the value of n exceeds the right margin value, ESC+l+n is ineffective and the left margin does not change.
- Setting the left margin position clears all data in the print buffer.
- In proportional spacing, the value of "n" is based on 10 cpi.
- Once the left margin position is set, a change in the character mode will not alter this left margin setting.
- Permissible values of "n" are given below.

PICA	$0 \leqq n \leqq 78$
ELITE	$0 \leqq n \leqq 93$
MICRON	$0 \leqq n \leqq 117$
COMPRESSED	$0 \leqq n \leqq 133$

RIGHT MARGIN:

Sets position of right margin.

Name: ESC+Q+n
Dec.: 27, 81, n
Hex.: 1B, 51, n

Comments:

- Permissible values of "n" are given below.

PICA	2≦n≦80
ELITE	3≦n≦96
MICRON	3≦n≦120
COMPRESSED	4≦n≦137

- Any designation to the left of the left margin position is ignored.
- Setting the right margin clears all data in the buffer.
- In proportional spacing, the value of "n" is based on 10 cpi.
- Once the right margin position is set, a change in the character mode will not alter this right margin setting.

SKIP PERFORATION:

Sets skip perforation.

Name:	Set: ESC+N+n	Release: ESC+O
Dec.:	27, 78, n	27, 79
Hex.:	1B, 4E, n	1B, 4F

Comments:

- The value of n specifies the number of lines (or n times the current line spacing amount) to be skipped at the bottom of the page.
- This command is effective only for 1≦n≦127. If n≧128, the value is processed as n−128.
- The skip perforation amount does not change even if the paper feed amount is changed following a skip perforation designation.
- The skip perforation setting is released upon receipt of the page length designation command.
- If skip perforation is set to ON in the Initial Setup mode, the skip perforation amount is set to 1 inch (25.4 mm) unless changed by this command. If skip perforation is set to OFF in the Initial Setup mode, skip perforation is not executed unless specified by ESC+N+n.
- ESC+O will override the skip perforation setting established when skip perforation is set to ON in the Initial Setup mode.

HORIZONTAL TAB STOP SETTING:

Sets horizontal tabulations to specified values:

Name:	Set:	ESC+D+n_1+n_2+...+ n_x+0	Release:	ESC+D+0
Dec.:		27, 68, n_1, n_2,...,n_x, 0		27, 68, 0
Hex.:		1B, 44, n_1, n_2,...,n_x, 00		1B, 44, 00

Comments:

- Horizontal tabs are set from the left margin position.
- Horizontal tabs must be designated such that $n_1<n_2<...<n_x$.
- A maximum of 32 tabs may be set on a single line.
- ESC+D+n_1+n_2+...+n_x+0 sets horizontal tab stops. The HT command executes the tab designation.
- In proportional spacing, horizontal tabs are set based on 10 cpi.
- When the left margin is changed, horizontal tabs will be moved based on new margin setting.
- When the printer is powered up, TAB is automatically set every 8 characters.
- If the character is altered after designation of horizontal tabs, the tab positions do not move.

HORIZONTAL TAB EXECUTION:

Executes the horizontal TAB as designated by ESC+D+n_1 +n_2+...+n_x+0.

Name:	HT
Dec.:	9
Hex.:	09

Comments:

- If the value of the horizontal TAB is less than the present column position, that HT is ignored.
- When in underline mode, the blank spaces between consecutive HT print positions are not underlined.

VERTICAL TAB STOP SETTING:

Sets vertical tabulation to specified values.

Name:	Set:	ESC+B+n_1+n_2+...+n_x+0	Release:	ESC+B+0
Dec.:		27, 66, n_1, n_2,...,n_x, 0		27, 66, 0
Hex.:		1B, 42, n_1, n_2,...,n_x, 00		1B, 42, 00

Comments:

- VT is set from the top of page position.
- Vertical tabs must be designated such that $n_1<n_2<...<<n_x$.
- A maximum of 16 tabs may be set.
- ESC+B+n_1+n_2+...+n_x+0 sets vertivertical tab stops. The VT command executes the tab designation.
- If the paper feed amount is changed after a designation of vertical tabs, tab positions do not change.
- VT setting is released by page length designation commands.

VERTICAL TAB EXECUTION:

Executes the vertical TAB as designated by ESC+B+n_1+n_2+...+n_x+0, ESC+b+m+n_1+n_2+...+n_x+0

Name:	VT
Dec.:	11
Hex.:	0B

Comments:

- When TABs are set with VT or VFU setting command and when there is no tab setting on a position exceeding present line, data is printed out and paper is fed to the next top of page position (same as FF).
- When turn the power switch ON, the vertical TABs are set every one line.
- When vertical TAB is cleared by ESC+B+0, execution of VT causes data in the buffer to be printed and does not advance the paper.

VFU CHANNEL SELECTION:

Selects one of eight channels in the Vertical Format Unit (VFU).

Name:	ESC+/+n	(0≦n≦7)
Dec.:	27, 47, n	
Hex.:	1B, 2F, n	

Comments:

- The value of n must be in the range 0≦n≦7 and selects one of eight channels (0~7).
- Channel 0 is the default setting.

VFU SETTING:

Sets the tab position of each channel in the VFU (Vertical Format Unit).

	Set:	Release:
Name:	ESC+b+m+n_1+n_2+...+n_x+0 (0≦m≦7, 1≦x≦16)	ESC+b+m+0
Dec.:	27, 98, m, n_1, n_2,...,n_x, 0	27, 98, m, 0
Hex.:	1B, 62, m, n_1, n_2,...,n_x, 00	1B, 62, m, 00

Comments:

- The VFU has 8 channels. A maximum of 16 vertical tabs can be set by each channel.
- The VFU is valid for 0≦m≦7 and selects one channel based on the value of "m" .
- Any VFU setting exceeding the page length is ineffective.
- To operate the VFU, input the VT code (11 DEC) after selecting the channel via VFU channel selection command (ESC+/+n).
- The VFU position does not change even if paper feed amount is altered after VFU setting.
- The vertical tab specified with ESC+B+n_1+n_2+...+n_x+0 is set to VFU channel 0.
- The VFU setting is released by the page length designation commands.

BACKSPACE:

Prints data in buffer and backspaces one space before printing next character.

Name: BS
Dec.: 8
Hex.: 08

Comments:

- Since BS backspaces the width of a character, the backspacing amount will depend upon the character mode set when the BS code was received.
- This command is ignored in the word processing mode (ESC+a+1, ESC+a+2 or ESC+a+3).

CARRIAGE RETURN:

Prints all data in buffer and designates that the next line starts at the left margin.

Name: CR
Dec.: 13
Hex.: 0D

Comments:

- Certain computers issue an automatic line feed with a carriage return. Check your computer manual for details.
- When automatic LF is set to ON in the Initial Setup mode, the paper is fed automatically (a LF is executed automatically) whenever a CR code is executed.
- CR code releases single line double width printing set by SO or ESC+SO.

HOME PRINT HEAD:

Causes print head to return to its home position.

Name: ESC+<
Dec.: 27, 60
Hex.: 1B, 3C

SINGLE DIRECTION:

Sets single direction (left to right) printing mode.

Name:	Set:	ESC+U+1	Release:	ESC+U+0
Dec.:		27, 85, 1		27, 85, 0
Hex.:		1B, 55, 01		1B, 55, 00

HALF SPEED PRINTING:

Sets printing to half speed.

Name:	Set:	ESC+s+1	Release:	ESC+s+0
Dec.:		27, 115, 1		27, 115, 0
Hex.:		1B, 73, 01		1B, 73, 00

Comment:

- Half speed printing can be set only in the draft pica, draft elite, standard density image, double speed double density image, CRT I image and CRT II image modes.

RELATIVE HORIZONTAL POSITION:

Moves the print head to a relative horizontal position.

Name:	ESC+\+n_1+n_2
Dec.:	27, 92, n_1, n_2
Hex.:	1B, 5C, n_1, n_2

Comments:

- This command moves the print head ($n_1+256\times n_2$)/120 inch in draft, or ($n_1+256\times n_2$)/180 inch in LQ from current position at which point printing of subsequent data will start.
- The print head can be moved to the right or left.
  To move m dots to right: n_1=m mode 256, n_2=INT (m/256)
  To move m dots to left: n_1=(65536−m)−$n_2\times 256$,
  n_2=INT(65536−m/256)

ABSOLUTE HORIZONTAL POSITION:

Moves the print head to an absolute horizontal position.

Name: ESC+$+$n_1$+$n_2$
Dec.: 27, 36, n_1, n_2
Hex.: 1B, 24, n_1, n_2

Comment:

- This command moves the print head to a position $n_1+256\times n_2$ dots (units) from the left margin. Each unit equals 1/60th of an inch.

CANCEL:

Clears all data in the buffer.

Name: CAN
Dec.: 24
Hex.: 18

REMOTE PRINTER SELECT:

Selects the printer remotely, enabling it to receive data.

Name: DC1 (Device Control 1)
Dec.: 17
Hex.: 11

Comments:

- Receipt of DC1 while the printer is deselected by DC3 enables the printer to receive data.
- The printer buffer data previously received between DC3 and DC1 is lost.

REMOTE PRINTER DESELECT:

Deselects the printer remotely, disabling it from receiving data.

Name: DC3 (Device Control 3)
Dec.: 19
Hex.: 13

Comment:

- All data sent in deselect status become invalid. In order to return to select status, send DC1 code.

DELETE:

Deletes the last character stored in the buffer.

Name: DEL
Dec.: 127
Hex.: 7F

Comments:

- Only ordinary text may be DELeted. Bit image data, spacing between output generated by consecutive TABs, and character mode designations cannot be DELeted.
- This command is ignored in the word processing mode (ESC+a+1, ESC+a+2 or ESC+a+3).

MSB ON:

Sets the Most Significant Bit to 1.

Name: ESC+>
Dec.: 27, 62
Hex.: 1B, 3E

Comments:

- ESC+> has no effect on bit image data.
- This setting can be released by ESC+#.

MSB OFF:

Sets the Most Significant Bit to 0.

Name: ESC+=
Dec.: 27, 61
Hex.: 1B, 3D

Comments:

- ESC+= has no effect on bit image data.
- This setting can be released by ESC+#.

CANCELS MSB SETTING:

Sets printer to receive 8th bit "as is".

Name: ESC+#
Dec.: 27, 35
Hex.: 1B, 23

Comments:
- This setting has no effect on bit image data.
- This setting can not be affected by data length setting in the Initial Setup mode.

FONT DOWN LINE LOADING:

Defines down line load characters into specified address locations in RAM.

Name: ESC+&+0+n+m+d_0+d_1+d_2+P_1+...+P_x
Dec.: 27, 38, 0, n, m, d_0, d_1, d_2, P_1,...,P_x
Hex.: 1B, 26, 00, n, m, d_0, d_1, d_2, P_1,...,P_x

Comments:
- The values n and m are the ASCII address location of the first and last characters being defined.
- The values of d_0, d_1 and d_2 define the character cell.
  d_0=Left Space
  d_1=Body
  d_2=Right Space
- The values of d_0, d_1 and d_2 vary with pitch as follows:

	d_1	$d_0+d_1+d_2$ (total)
Draft	9	12
LQ 10 cpi	29	36
LQ 12 cpi	23	30
LQ 15 cpi	15	24
PS	37	42

Note: In PS, values of d_1, and $d_0+d_1+d_2$ are maximum.

SELECTS ROM CG OR DOWNLOADED CG:

Name: ESC+%+n (n=0, 1)
Dec.: 27, 37, n
Hex.: 1B, 25, n

Comment:
- The following values of n can be used.
  n=0: Select ROM CG
  n=1: Select downloaded CG

ROM CHARACTER GENERATION SET COPY:

Copies internal ROM CG font into downloadable font area.

Name: ESC+:+0+0+0
Dec.: 27, 58, 0, 0, 0
Hex.: 1B, 3A, 00, 00, 00

Comments:
- All ROM CG font in draft and LQ modes are copied to the downloadable font area.
- Upon receipt of the command, all previous downloaded fonts will be changed to ROM CG font.
- When altering only part of the ROM CG, use this command before font downloading.

BELL:

Sounds buzzer for approximately 0.5 second.

Name: BEL
Dec.: 7
Hex.: 07

ESCAPE:

First byte of each multi-byte printer control code.

Name: ESC
Dec.: 27
Hex.: 1B

Comment:
- Cannot be generated by the ESC key on certain computers.

NULL:

Last byte of certain multi-byte printer control codes.

Name: NUL
Dec.: 0
Hex.: 00

RESET PRINTER:

Initializes printer, causing data in the print buffer, but not in the receive buffer, to be cleared.

Name: ESC+@
Dec.: 27, 64
Hex.: 1B, 40

Comment:
- Refer to Section 3.5 on page 3-17 for an explanation of printer initialization.

SELECTS CSF:

Selects Cut Sheet Feeder(CSF) mode ON/OFF.

Name: ESC+EM+n
Dec.: 27, 25,n
Hex.: 1B, 19, n

Comment:

- The following values of n can be used.

n=82 or "R":	Eject and Load a sheet
n=0:	Cut Sheet Feeder mode is OFF
n=4:	Cut Sheet Feeder mode is ON

Note: If the Cut Sheet Feeder mode set to ON without installing the CSF, the paper will not feed correctly.

7. IBM Proprinter X24 Mode Commands

This chapter covers software commands of IBM Proprinter X24 mode. The software commands are grouped into the following classifications:

FONT SELECTION

Name	Function	Page
ESC+I+n	Selects print mode	7-5
ESC+k+n	Selects print font style	7-6
ESC+S+0	Selects superscript printing	7-6
ESC+S+1	Selects subscript printing	7-6
ESC+T	Releases sub/superscript printing	7-6

CHARACTER PITCH SELECTION

Name	Function	Page
ESC+:	Sets elite pitch (12 cpi) printing	7-7
SI	Sets compressed (17 cpi) printing	7-7
ESC+SI	Sets compressed (17 cpi) printing	7-7
DC2	Releases elite and compressed printing	7-7
ESC+P+1	Sets proportional spacing	7-7
ESC+P+0	Releases proportional spacing	7-7

CHARACTER HIGHLIGHT SELECTION

Name	Function	Page
ESC+E	Sets emphasized printing	7-8
ESC+F	Releases emphasized printing	7-8
ESC+G	Sets double strike printing	7-8
ESC+H	Releases double strike printing	7-8
DC4	Releases single-line double width printing	7-8
SO	Sets single-line double width printing	7-8
ESC+SO	Sets single-line double width printing	7-8
ESC+W+1	Sets double width printing	7-9
ESC+W+0	Releases double width printing	7-9
ESC+[+@+n_1+n_2 +m_1+m_2+m_3+m_4	Selects double high & double width printing	7-9
ESC+−+1	Sets underlining	7-10
ESC+−+0	Releases underlining	7-10
ESC+_+1	Sets overlining	7-10
ESC+_+0	Releases overlining	7-10

IBM Proprinter X24 Mode Commands

CHARACTER SET SELECTION

Name	Function	Page
ESC+7	Sets alternate character set 1	7-10
ESC+6	Sets alternate character set 2	7-11

BIT IMAGE (GRAPHICS) MODE SELECTION

Name	Function	Page
ESC+K+n_1+n_2	Sets 8-pin image standard density (60 dpi)	7-11
ESC+L+n_1+n_2	Sets 8-pin image double density (120 dpi)	7-11
ESC+Y+n_1+n_2	Sets 8-pin image double density/double speed (120 dpi)	7-11
ESC+Z+n_1+n_2	Sets 8-pin image quadruple density (240 dpi)	7-12
ESC+*+m +n_1+n_2 (AGM only)	Sets bit image mode selection (8-pin 60, 80, 90, 120, 120D, 240 24-pin 60, 90, 120, 180, 240, 360)	7-12
ESC+[+g+n_1 +n_2+m	Sets bit image mode selection (8-pin 60, 120, 120D, 240 24-pin 60, 120, 180, 360)	7-13

PAPER FEED SELECTION—Amount

Name	Function	Page
ESC+0	Sets paper feed to 1/8 inch (3.2 mm)	7-13
ESC+1	Sets paper feed to 7/72 inch (2.5 mm)	7-14
ESC+2	Executes line spacing set by ESC+A+n	7-14
ESC+A+n	Sets paper feed to n/72 inch	7-14
ESC+3+n	Sets paper feed to n/216 inch or n/180 inch	7-15
ESC+[+\+n_1+n_2 +n_3+n_4+n_5+n_6	Selects the base line feed unit for ESC+3 and ESC+J	7-15
ESC+5+1	Set automatic line feed	7-16
ESC+5+0	Releases automatic line feed	7-16

PAPER FEED SELECTION—Execution

Name	Function	Page
LF	Feeds paper one line	7-16
FF	Feeds paper to next top of form position	7-17
ESC+J+n	Executes one-line paper feed of n/216 inch or n/180 inch	7-17

PAGE FORMAT CONTROL

Name	Function	Page
ESC+C+0+n	Sets page length in inches	7-18
ESC+C+n	Sets page length in lines	7-18
ESC+X+n_1+n_2	Sets left and right margin	7-19
ESC+N+n	Sets skip perforation	7-19
ESC+O	Releases skip perforation	7-19
ESC+4	Sets top of form	7-20

TABULATION—Horizontal

Name	Function	Page
ESC+D+n_1+... +n_x+0	Sets horizontal tab	7-20
ESC+D+0	Releases horizontal tab	7-20
HT	Executes horizontal tab	7-21

TABULATION—Vertical

Name	Function	Page
ESC+B+n_1+... +n_x+0	Sets vertical tab	7-21
ESC+B+0	Releases vertical tab	7-21
VT	Executes vertical tab	7-22
ESC+R	Returns to default tabs	7-22

IBM Proprinter X24 Mode Commands

CARRIAGE CONTROL

Name	Function	Page
BS	Prints, then backspaces one character	7-23
CR	Prints a line, then returns carriage	7-23
ESC+U+1	Sets single direction printing	7-23
ESC+U+0	Releases single direction printing	7-23
ESC+d+n_1+n_2	Sets relative position	7-24

DATA CONTROL

Name	Functions	Page
CAN	Clears data in buffer	7-24
DC1	Selects printer remotely	7-24
ESC+Q+36	Deselects printer remotely	7-25

DOWN LINE LOAD CHARACTER SELECTION

Name	Function	Page
ESC+=+n_1+n_2 +35+A_1+A_2	Defines download font	7-25

MISCELLANEOUS

Name	Function	Page
BEL	Sounds the buzzer	7-25
ESC	First byte of multi-byte control codes	7-26
NUL	Last byte of certain multi-byte control codes	7-26
ESC+\+n_1+n_2	Prints continuously from all character chart	7-26
ESC+^	Prints one character from all character chart	7-27
ESC+j	Sets OFF LINE mode	7-27

PRINT MODE SELECT:

Selects the printing fonts and quality.

Name: ESC+I+n
Dec.: 27, 73, n
Hex.: 1B, 49, n

Comments:

- This command selects the Character Generator (ROM CG or DOWNLOAD character) and printing fonts.

n=0:	Internal characters Draft 10 cpi font
n=2:	Internal characters LQ 10 cpi font
n=3:	Internal characters Proportional LQ font
n=4:	Download characters Draft 10 cpi font
n=6:	Download characters LQ 10 cpi font
n=7:	Download characters Proportional LQ font
n=8:	Internal characters Draft 12 cpi font
n=10:	Internal characters LQ 12 cpi font
n=12:	Download characters Draft 12 cpi font
n=14:	Download characters LQ 12 cpi font
n=16:	Internal characters Draft 17 cpi font
n=18:	Internal characters LQ 17 cpi font
n=20:	Download characters Draft 17 cpi font
n=22:	Download characters LQ 17 cpi font

- This command is operational only when the FONT and PITCH is set to "PGM" on the Control Table.

FONT STYLE:

Selects font style.

Name:	ESC+k+n	(n=0, 1, 2, 3, 4)
Dec.:	27, 107, n	
Hex.:	1B, 6B, n	

Comments:

- The following values can be used.

n=0:	Bold PS font
n=1:	Sans Serif font
n=2:	Courier font
n=3:	Prestige font
n=4:	Script font

- IBM characters in locations 0~31$_{DEC}$ (except 19, 20, 21$_{DEC}$) [00~1F$_{HEX}$ (except 13, 14, 15$_{HEX}$)] and 250~255$_{DEC}$ (F0~FF$_{HEX}$) are printed in Courier font, regardless of font selection.

SUB/SUPERSCRIPT FONT:

Selects sub/superscript font with characters printed on the bottom/top 2/3 area of the line. Characters are reduced to 2/3 their original height.

Name:	Set:	ESC+S+n	Release:	ESC+T
	(Subscript: n=1/Superscript: n=0)			
Dec.:		27, 83, n		27, 84
Hex.:		1B, 53, n		1B, 54

Comments:

- Sub/superscript characters are 2/3 normal height.
- Sub/superscript characters can be printed in the letter quality or draft mode.
- Sub/superscript characters are normal width.

ELITE PITCH:

Sets printing to 12 characters per inch (96 characters per line).

Name:	Set:	ESC+:	Release:	DC2
Dec.:		27, 58		18
Hex.:		1B, 3A		12

Comment:

- This command is operational only when the PITCH is set to "PGM" on the Control Table.

COMPRESSED PITCH:

Sets printing to 17 characters per inch (137 characters per line).

Name:	Set:	SI or ESC+SI	Release:	DC2
Dec.:		15 or 27, 15		18
Hex.:		0F or 1B, 0F		12

Comment:

- This command is operational only when the PITCH is set to "PGM" on the Control Table.

PROPORTIONAL SPACING:

Sets proportional spacing between characters.

Name:	Set:	ESC+P+1	Releases:	ESC+P+0
Dec.:		27, 80, 1		27, 80, 0
Hex.:		1B, 50, 01		1B, 50, 00

Comments:

- This command is operational only when the PITCH is set to "PGM" on the Control Table.
- This command is ineffective when the FONT is set to Draft on the Control Table.

EMPHASIZED PRINTING:

Sets printing to twice the original horizontal dot density.

Name:	Set:	ESC+E	Release:	ESC+F
Dec.:		27, 69		27, 70
Hex.:		1B, 45		1B, 46

Comment:

- Emphasized characters are printed at half speed (100 characters per second in draft pica pitch).

DOUBLE STRIKE PRINTING:

Sets double strike character printing.

Name:	Set:	ESC+G	Release:	ESC+H
Dec.:		27, 71		27, 72
Hex.:		1B, 47		1B, 48

DOUBLE WIDTH PRINTING—SINGLE LINE:

Sets double width (elongated) character printing for one line only.

Name:	Set:	Release:
	SO or ESC+SO	DC4 or ESC+W+0
Dec.:	14 or 27, 14	20 or 27, 87, 0
Hex.:	0E or 1B, 0E	14 or 1B, 57, 00

Comment:

- Single-line double width printing is released when:
  - —a LF, FF, or VT is executed.
  - —a CR is executed.
  - —DC4 or ESC+W+0 is executed.

DOUBLE WIDTH PRINTING:

Sets double width (elongated) character printing.

Name:	Set:	ESC+W+1	Release:	ESC+W+0
Dec.:		27, 87, 1		27, 87, 0
Hex.:		1B, 57, 01		1B, 57, 00

Comment:

- Double width printing set by ESC+W+1 is only released by ESC+W+0.

DOUBLE HIGH AND DOUBLE WIDTH PRINTING:

Sets printing to double high, double width, or both at the same time.

Name: ESC+[+@+n_1+n_2+m_1+m_2+m_3+m_4
Dec.: 27, 91, 64, n_1, n_2, m_1, m_2, m_3, m_4
Hex.: 1B, 5B, 40, n_1, n_2, m_1, m_2, m_3, m_4

Comments:

- The value of n_1, n_2, m_1 and m_2 must be used as follows:
  n_1=4, n_2=0, m_1=0, m_2=0
- The value of m_3 selects both the line feed and character height as follows:

	Function	
m_3	Line feed	Character height
0	Unchanged	
1	Unchanged	Signle-line
2	Unchanged	Double-high
16	Single	Unchanged
17	Single	Single-high
18	Single	Double-high
32	Double	Unchanged
33	Double	Single-high
34	Double	Double-high

- The value of m_4 selects the character width as follows:
  m_4=1: Single-width
  m_4=2: Double-width

UNDERLINING:

Sets continuous underlining of characters.

Name:	Set:	ESC+−+1	Release:	ESC+−+0
Dec.:		27, 45, 1		27, 45, 0
Hex.:		1B, 2D, 01		1B, 2D, 00

Comments:

- Bit image data, spaces set by the HT code and IBM Graphic characters are not underlined.
- Pin No. 24 of the print head is used for underlining.

OVERLINING:

Sets continuous overlining of characters.

Name:	Set:	ESC+_+1	Release:	ESC+_+0
Dec.:		27, 95, 1		27, 95, 0
Hex.:		1B, 5F, 01		1B, 5F, 00

Comments:

- Bit image data, spaces set by the HT code and IBM Graphic characters are not overlined.
- Pin No. 1 of the print head is used for overlining.

IBM CHARACTER SET I:

Selects IBM Proprinter X24 character set 1.

Name:	ESC+7
Dec.:	27, 55
Hex.:	1B, 37

Comment:

- Refer to Appendix A.

IBM CHARACTER SET II:

Selects IBM Proprinter X24 character set 2.

Name: ESC+6
Dec.: 27, 54
Hex.: 1B, 36

Comment:
- Refer to Appendix A.

8-PIN STANDARD DENSITY GRAPHICS:

Sets standard density graphics mode [480 dots per line/60 dots per inch (25.4 mm)].

Name: ESC+K+n_1+n_2+Data
Dec.: 27, 75, n_1, n_2, Data
Hex.: 1B, 4B, n_1, n_2, Data

8-PIN DOUBLE DENSITY GRAPHICS:

Sets double density graphic mode [960 dots per line/120 dots per inch (25.4 mm)].

Name: ESC+L+n_1+n_2+Data
Dec.: 27, 76, n_1, n_2, Data
Hex.: 1B, 4C, n_1, n_2, Data

DOUBLE SPEED, DOUBLE DENSITY GRAPHICS:

Sets double speed, double density graphics mode [960 dots per line/120 dots per inch (25.4 mm)].

Name: ESC+Y+n_1+n_2+Data
Dec.: 27, 89, n_1, n_2, Data
Hex.: 1B, 59, n_1, n_2, Data

Comment:
- Horizontally adjacent dots cannot be printed.

8-PIN QUADRUPLE DENSITY GRAPHICS:

Sets quadruple density graphics mode [1920 dots per line/240 dots per inch (25.4 mm)].

Name: ESC+Z+n_1+n_2+Data
Dec.: 27, 90, n_1, n_2, Data
Hex.: 1B, 5A, n_1, n_2, Data

Comment:
- Horizontally adjacent dots cannot be printed.

BIT IMAGE MODE SELECTION (AGM):

Selects one of 8-pin and 24-pin bit image graphic modes (AGM only).

Name: ESC+*+m+n_1+n_2+Data
(m=0, 1, 2, 3, 4, 6, 32, 33, 38, 39, 40)
Dec.: 27, 42, m, n_1, n_2, Data
Hex.: 1B, 2A, m, n_1, n_2, Data

Comments:
- The following table illustrates the various modes based upon the values of m.

m	Pin	Dots/Inch	Dots/Line	
0	8	60	480	Standard Density
1	8	120	960	Double Density
2	8	120	960	Double Speed, Double Density
3	8	240	1920	Quadruple Density
4	8	80	640	CRT I
6	8	90	720	CRT II
32	24	60	480	Standard Density
33	24	120	960	Double Density
38	24	90	720	CRT III
39	24	180	1440	Triple Density
40	24	360	2880	Hex Density

- When m=2, 3, 40, Horizontal adjacent dots cannot be printed.
- This command is effective only when AGM mode is set to ON in the Initial Setup mode.

BIT IMAGE MODE SELECTION:

Selects one of 8-pin and 24-pin bit image graphic modes.

Name: ESC+[+g+n_1+n_2+m+Data (m=0, 1, 2, 3, 8, 9, 11, 12)
Dec.: 27, 91, 103, n_1, n_2, m, Data
Hex.: 1B, 5B, 67, n_1, n_2, m, Data

Comments:

- The following table illustrates the various modes based upon the values of m.

m	Pin	Dots/Inch	Dots/Line	
0	8	60	480	Standard Density
1	8	120	960	Double Density
2	8	120	960	Double Speed, Double Density
3	8	240	1920	Quadruple Density
8	24	60	480	Standard Density
9	24	120	960	Double Density
11	24	180	1440	Triple Density
12	24	360	2880	Hex Density

- When m=2, 3, 12, Horizontal adjacent dots cannot be printed.

1/8 INCH PAPER FEED:

Sets paper feed amount to 1/8 inch (3.2 mm).

Name: ESC+0
Dec.: 27, 48
Hex.: 1B, 30

Comment:

- ESC+0 sets 1/8 inch paper feed in all printer modes.

7/72 INCH PAPER FEED:

Sets paper feed amount to 7/72 inch (2.5 mm).

Name:	ESC+1
Dec.:	27, 49
Hex.:	1B, 31

LINE SPACING:

Executes line spacing set by ESC+A+n.

Name:	ESC+2
Dec.:	27, 50
Hex.:	1B, 32

---

n/72 INCH PAPER FEED SELECTION:

Sets programmable paper feed amount to n/72 inch.

Name:	ESC+A+n
Dec.:	27, 65, n
Hex.:	1B, 41, n

Comments:

- ESC+2 must be input after ESC+A+n for n/72 inch paper feed to become effective (when AGM is set to OFF only).
- n/72 inch paper feed is valid for $0 \leqq n \leqq 85$.
- The IBM Proprinter X24 mode defaults to 1/6 inch.
- This command sets one line paper feed of n/60 inch in the AGM mode.

n/216 INCH PAPER FEED SELECTION:

Sets programmable paper feed amount to n/216 inch.

Name: ESC+3+n
Dec.: 27, 51, n
Hex.: 1B, 33, n

Comments:

- n/216 inch paper feed is valid for $0 \leqq n \leqq 255$.
- The paper feed amount is not exactly n/216 inch, for the minimum unit is 1/360 inch.
- This command sets one line paper feed of n/180 inch in the AGM mode.

LINE FEED PITCH SELECTION:

Selects line base unit for ESC+3 and ESC+J.

Name: ESC+[+\+n_1+n_2+n_3+n_4+n_5+n_6
Dec.: 27, 91, 92, n_1, n_2, n_3, n_4, n_5, n_6
Hex.: 1B, 5B, 5C, n_1, n_2, n_3, n_4, n_5, n_6

Comments:

- The values of n_1, n_2, n_3 and n_4 must be used as follows:
  $n_1=4$
  $n_2=n_3=n_4=0$
- The values of n_5 and n_6 select the base line feed unit for ESC+3 and ESC+J.

	Base unit
$n_5=0$, $n_6=180$	1/180 inch
$n_5=0$, $n_6=216$	1/216 inch

- Other values of n_5 and n_6 are unsupported.

AUTOMATIC LINE FEED MODE:

Automatically executes a Line Feed following a Carriage Return.

Name:	Set:	ESC+5+1	Release:	ESC+5+0
Dec.:		27, 53, 1		27, 53, 0
Hex.:		1B, 35, 01		1B, 35, 00

Comments:

- Initial Setup mode also controls the auto line feed function (refer to Section 3.3). Setting this mode to ON is equivalent to executing the ESC+5+1 command. Similarly, setting the mode to OFF is equivalent to executing the ESC+5+0 command.
- LF is tied to CR in this mode.

LINE FEED (LF):

Causes data in buffer to be printed and then executes a single line feed.

Name:	LF
Dec.:	10
Hex.:	0A

Comments:

- When the new line position falls within the perforation skip area, the paper advances to the next top of form position.
- If there is no data, "space" data (ASCII 32), or blanks between HT print positions in the buffer, LF feeds the paper 1 line.
- The amount of spacing generated by LF is a function of the paper feed amount setting.
- LF code releases single-line double width printing set by SO and ESC+SO.
- Initial Setup mode controls the Automatic CR function. When this mode is set to OFF, LF executes a single line feed. The carriage, however, does not return to the left margin position. When this mode is set to ON, a Carriage Return command (CR) is added to each Line Feed (LF).

FORM FEED (FF):

Feeds paper to next top of form position after first printing any data in the buffer.

Name: FF
Dec.: 12
Hex.: 0C

Comments:

- FF releases single-line double width printing set by SO and ESC+SO.
- Amount of form feed depends upon page length set by the page length control command or the EZ Set Operator panel.

---

n/216 INCH PAPER FEED SELECTION:

Prints out the data in the print buffer and feeds the paper n/216 inch or n/180 inch.

Name: ESC+J+n
Dec.: 27, 74, n
Hex.: 1B, 4A, n

Comments:

- When Initial Setup mode (Automatic CR) is set to ON, Carriage Return command (CR) is added automatically to this command.
- The value of n is valid for $0 \leqq n \leqq 255$
- This command sets the paper feed for one line only. Subsequent paper feed returns to previous setting. However, the carriage does not return to the left margin position. Instead, printing of next line begins where previous printing left off.
- This command does not release single-line double width printing.
- The paper feed amount is not exactly n/216 inch, for the minimum unit is 1/360 inch.
- This command sets one line paper feed of n/180 inch in the AGM mode.

PAGE LENGTH (INCHES):

Sets page length in inches.

Name: ESC+C+0+n
Dec.: 27, 67, 0, n
Hex.: 1B, 43, 00, n

Comments:

- Upon receipt of ESC+C+0+n, the present line position becomes the top of page position.
- The value of n must be in the range $1 \leqq n \leqq 225$.
- ESC+C+0+n releases the skip perforation settings.
- The page length does not change even if the paper feed amount is changed.
- The terms "form" and "page" are interchangeable.

PAGE LENGTH (LINES):

Sets page length in number of lines.

Name: ESC+C+n
Dec.: 27, 67, n
Hex.: 1B, 43, n

Comments:

- Upon receipt of ESC+C+n, the present line position becomes the top of page position.
- The value on n must be in the range $1 \leqq n \leqq 225$. If n=0, page length returns to the inch designation.
- ESC+C+n releases the skip perforation settings.
- The page length does not change even if the paper feed amount is changed.
- The terms "form" and "page" are interchangeable.

MARGIN SET:

Sets positions of left and right margins.

Name:	ESC+X+n_1+n_2
Dec.:	27, 88, n_1, n_2
Hex.:	1B, 58, n_1, n_2

Comments:

- The left margin column is set to n_1 in the current width, and the right margin column is set to n_2.
- Permissible values of n_1, n_2 are given below.

Pica print	$0 \leqq n_1 \leqq 78$	$2 \leqq n_2 \leqq 80$
Elite print	$0 \leqq n_1 \leqq 93$	$3 \leqq n_2 \leqq 96$
Compressed print	$0 \leqq n_1 \leqq 133$	$4 \leqq n_2 \leqq 137$

- Any right margin designation to the left of the left margin position is ignored.
- Setting the margin clears all data in the buffer.
- Once the margin position is set, a change in the character mode will not alter this margin setting.
- When $n_1=0$, the left margin does not change. When $n_2=0$, the right margin does not change.

SKIP PERFORATION:

Sets skip perforation.

Name:	Set:	ESC+N+n	Release:	ESC+O
Dec.:		27, 78, n		27, 79
Hex.:		1B, 4E, n		1B, 4F

Comments:

- The value of n specifies the number of lines (or n times the current line spacing amount) to be skipped at the bottom of the page.
- This command is effective only for $0 \leqq n \leqq 255$.
- The skip perforation amount does not change even if the paper feed amount is changed following a skip perforation designation.
- The skip perforation setting is released upon receipt of the page length designation command.
- If Initial Setup mode is set to ON, the skip perforation amount is set to 1 inch (25.4=mm) unless changed by this command. If Initial setup mode is set to OFF, skip perforation is not executed unless specified by ESC+N+n.
- ESC+O will override the skip perforation setting established when Initial Setup mode is set to ON.

TOP OF FORM:

Sets top of form.

Name:	ESC+4
Dec.:	27, 52
Hex.:	1B, 34

Comment:

- This command sets the current paper position as the top of form.

HORIZONTAL TAB STOP SETTING:

Sets horizontal tabulations to specified values.

Name:	Set:	Release:
	ESC+D+n_1+n_2+...+n_x+0	ESC+D+0
Dec.:	27, 68, n_1, n_2,...,n_x, 0	27, 68, 0
Hex.:	1B, 44, n_1, n_2,...,n_x, 00	1B, 44, 00

Comments:

- Horizontal tabs are set from the left margin position.
- Horizontal tabs must be designated such that $n_1 < n_2 < \ldots < n_x$.
- A maximum of 32 tabs may be set on a single line.
- ESC+D+n_1+n_2+...+n_x+0 sets horizontal tab stops. The HT command executes the tab designation.
- In proportional spacing, horizontal tabs are set based on 10 cpi.
- If the character pitch is altered after designation of horizontal tabs, the tab positions change.
- When the left margin is changed, horizontal tabs will be moved based on new margin setting.
- When the printer is powered up, tab is automatically set every 8 characters.

HORIZONTAL TAB EXECUTION:

Executes the horizontal TAB as designated by ESC+D+n_1+n_2+...+n_x+0.

Name:	HT
Dec.:	9
Hex.:	09

Comments:

- If the value of the horizontal TAB is less than the present column position, that HT is ignored.
- When in underline mode, the blank spaces between consecutive HT print positions are not underlined.

VERTICAL TAB STOP SETTING:

Sets vertical tabulation to specified values.

	Set:	Release:
Name:	ESC+B+n_1+n_2+...+n_x+0	ESC+B+0
Dec.:	27, 66, n_1, n_2,..., n_x, 0	27, 66, 0
Hex.:	1B, 42, n_1, n_2,..., n_x, 00	1B, 42, 00

Comments:

- VT is set from the top of page position.
- Vertical tabs must be designated such that $n_1<n_2<...<n_x$.
- A maximum of 64 tabs may be set.
- ESC+B+n_1+n_2+...+n_x+0 sets vertical tab stops. The VT command executes the tab designation.
- If the paper feed amount is changed after a designation of vertical tabs, the tab positions do not change.

VERTICAL TAB EXECUTION:

Executes the vertical TAB as designated by ESC+B+n_1+n_2+...+n_x+0.

Name: VT
Dec.: 11
Hex.: 0B

Comments:

- When TABs are set with VT setting command and there is no tab setting on a position exceeding present line, data is printed out and advances the paper one line (same as LF).
- When vertical TAB has not been set by ESC+B+n_1+n_2+...+n_x+0, execution of VT causes data in the buffer to be printed and advances the paper one line (same function as LF).

ALL TAB INITIAL CLEAR:

Sets all tabs to power ON settings.

Name: ESC+R
Dec.: 27, 82
Hex.: 1B, 52

Comment:

- This command sets horizontal tabs at every 8th position, and clears all vertical tabs.

BACKSPACE:

Prints data in buffer and backspaces one space before printing next character.

Name:	BS
Dec.:	8
Hex.:	08

Comment:

- Since BS backspaces the width of a character, the backspacing amount will depend upon the character mode set when the BS code was received.

CARRIAGE RETURN:

Prints all data in buffer and designates that the next line starts at the left margin.

Name:	CR
Dec.:	13
Hex.:	0D

Comments:

- Certain computers issue an automatic line feed with a carriage return. Check your computer manual for details.
- When auto LF is set to ON in the Initial Setup mode, the paper is fed automatically (a LF is executed automatically) whenever a CR code is executed.

SINGLE DIRECTION:

Sets single direction (left to right) printing mode.

Name:	Set:	ESC+U+1	Release:	ESC+U+0
Dec.:		27, 85, 1		27, 85, 0
Hex.:		1B, 55, 01		1B, 55, 00

SETS RELATIVE POSITION:

Moves right n/120 inch.

Name:	ESC+d+n_1+n_2
Dec.:	27, 100, n_1, n_2
Hex.:	1B, 64, n_1, n_2

Comments:

- When underlining or overlining, spaces created by the move are underlining or overlining.
- This command moves the print head to a position $n_1+(256\times n_2)$ units from the current position. Each unit equals 1/120 of an inch.

CANCEL:

Clears all data in the buffer.

Name:	CAN
Dec.:	24
Hex.:	18

REMOTE PRINTER SELECT:

Selects the printer remotely, enabling it to receive data.

Name:	DC1 (Device Control 1)
Dec.:	17
Hex.:	11

Comments:

- Receipt of DC1 while the printer is deselected by ESC+Q+36 enables the printer to receive data.
- The print buffer data previously received between ESC+Q+36 and DC1 is lost.

REMOTE DESELECT PRINTER:

Deselects the printer remotely, disabling it from receiving data.

Name: ESC+Q+36
Dec.: 27, 81, 36
Hex.: 1B, 51, 24

Comment:

- All data sent in deselect status becomes invalid. In order to return to select status, send DC1 code.

FONT DOWN LINE LOADING:

Defines down line load characters into specified address locations in RAM.

Name: ESC+=+n_1+n_2+35+A_1+A_2+Data
Dec.: 27, 61, n_1, n_2, 35, A_1, A_2, Data
Hex.: 1B, 3D, n_1, n_2, 23, A_1, A_2, Data

Comments:

- This command is operational only when the 32K buffer option (KX-P43) is installed.
- When $n_1=n_2=0$, download characters are all cleared.
- Refer to Section 5.2 on page 5-3 for detailed information.

BELL:

Sounds buzzer for approximately 0.5 second.

Name: BEL
Dec.: 7
Hex.: 07

ESCAPE:

First byte of each multi-byte printer control code.

Name: ESC
Dec.: 27
Hex.: 1B

Comment:
- Cannot be generated by the ESC key on certain computers.

NULL:

Last byte of certain multi-byte printer control codes.

Name: NUL
Dec.: 0
Hex.: 00

ALL CHARACTER CHART PRINTING (Continuous):

Prints continuously from all character chart.

Name: ESC+\+n_1+n_2
Dec.: 27, 92, n_1, n_2
Hex.: 1B, 5C, n_1, n_2

Comments:
- This command allows the printing of all characters including characters with an ASCII value below decimal 32.
- Refer to IBM All Character Chart. (Appendix A).
- The values specified for n_1 and n_2 indicate how many characters to print from All Character Chart, calculating the total count with this formula; Total count=$n_2 \times 256 + n_1$.
- The data following this command and designated by n_1 and n_2, will be printed as characters from the All Character Chart.

ALL CHARACTER CHART PRINTING (Single):

Prints single character from all character chart.

Name: ESC+^
Dec.: 27, 94
Hex.: 1B, 5E

Comments:

- Only the next data following this command will be printed as a character from the All Character Chart.
- Refer to IBM All Character Chart (Appendix A).

SETS OFF LINE MODE:

Stops printing and goes to OFF LINE mode.

Name: ESC+j
Dec.: 27, 106
Hex.: 1B, 6A

Comment:

- When you desire to print again, press the ON LINE switch.

8. Interfacing

Parallel Interfacing

Communication with a computer is accomplished through a parallel interface based on the Centronics standard.

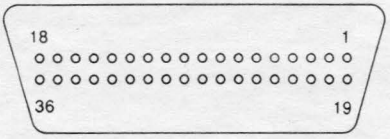
Specifications:

- data transfer speed: 1000 cps minimum
- synchronization: external STROBE pulse
- logic levels: TTL
- handshaking: BUSY and $\overline{\text{ACK}}$ signals
- connector type: 57-30360 (AMPHENOL) or equivalent
- cable: use a shielded cable 1.95 meters or less in length.

When the printer is processing data, the BUSY signal is high. The printer will not accept new data from the computer. After the processing is completed, the BUSY signal goes low. (The BUSY signal is also high when the printer is OFF LINE). When the BUSY signal occurs, the $\overline{\text{ACK}}$ signal goes low indicating to the computer that the data has been processed and the printer is ready to accept more data. This handshaking routine occurs each time a character is sent to the printer.

	BUSY	SLCT	PO	$\overline{\text{ERROR}}$
ON LINE	LOW	HIGH	LOW	HIGH
OFF LINE	HIGH	LOW	LOW	LOW
PAPER OUT	HIGH	LOW	HIGH	LOW

Printer Status signals



Note: This is not a 57-30360 connector.

Parallel Interface Connector (Printer side)

Signal pin	Return side pin	Signal	Direction
1	19	$\overline{\text{STB}}$	Input
2	20	DATA 1	
3	21	DATA 2	
4	22	DATA 3	
5	23	DATA 4	Input
6	24	DATA 5	
7	25	DATA 6	
8	26	DATA 7	
9	27	DATA 8	
10	28	$\overline{\text{ACK}}$	Output
11	29	BUSY	Output
12		PO	Output
13		SLCT	Output
14		$\overline{\text{AUTO FEED XT}}$	Input
15			
16		SG	
17		FG	
18		+5 V	Output
31	30	$\overline{\text{PRIME}}$	Input
32		$\overline{\text{ERROR}}$	Output
33		SG	
34			
35			
36			

Pin Configuration (Parallel)

Notes:

- "INPUT" refers to a signal coming into the printer. "OUTPUT" denotes a signal exiting the printer.
- "RETURN" denotes the return side wire of a twisted pair cable and is connencted to signal ground.
- All interface signals are at TTL levels.

Connector pin signals

$\overline{\text{STB}}$...STROBE

- This is a synchronizing input signal to read data into the printer.
- This signal is normally high. Data is read in when it goes low.
- The pulse must be low for at least 1 microsecond.

DATA 1–DATA 8

- These are the input signals which carry the 8 data bits of information.
- The signal is read in synchronization with the STROBE pulse. A high level indicates a logical "1".
- The signal must be present 0.5 microseconds before and after the STROBE pulse.

$\overline{\text{ACK}}$...ACKNOWLEDGE

- This is an output signal to the computer indicating that the printer is ready to receive the next block of data. It is sent out when the BUSY signal drops from high to low. Therefore, it can be thought of as a data request pulse.
- The signal is normally high. When the condition becomes true, the signal goes low.
- The $\overline{\text{ACK}}$ signal is automatically sent whenever the printer is switched ON LINE.

BUSY

- This output signal indicates the status of the printer. The signal is high when the printer is busy and cannot receive data.
- The signal is high under the following conditions:
  1. receive buffer full
  2. printer is processing data
  3. printer is OFF LINE
  4. printer is in an error condition

PO...PAPER OUT

- This output signal indicates that paper out detector detects the absence of paper.
- The signal is normally low and goes high during a "Paper Out" condition.

SLCT...SELECT

- SELECT is an output signal which indicates the ON LINE or OFF LINE state of the printer. The signal is high in the ON LINE state and low when OFF LINE.
- The printer enters the ON LINE state:
  1. when the printer is turned on
  2. when $\overline{\text{PRIME}}$ is received
  3. when the RESET command is received
  4. when the ON LINE switch is pressed

- The printer enters the OFF LINE state:
  1. when the printer is out of paper
  2. when the printer is switched OFF LINE

$\overline{\text{AUTO FEED XT}}$ ($\overline{\text{AFXT}}$)

- This input signal determines if a line feed (LF) command will be added to each carriage return (CR).
- When $\overline{\text{AFXT}}$ is low, CR+LF action occurs. When $\overline{\text{AFXT}}$ is high, only a carriage return is performed.
- Auto LF setting in the Control Table can alter the response by the printer to an $\overline{\text{AFXT}}$ signal. If auto LF is ON, the printer will perform a CR+LF regardless of the level of the incoming signal. When auto LF is OFF, this automatic action is disabled.

SG...SIGNAL GROUND

- The twisted pair return wires (pins 19–30) are connected to signal ground.

FG...FRAME GROUND

- Frame ground is the same as chassis ground.

+5 V

- This is for evaluation only. It should not be used to supply power for external equipment.

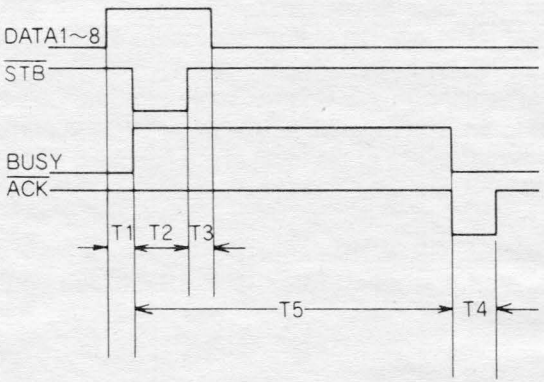
$\overline{\text{PRIME}}$

- This input signal is used to initialize the printer. The signal is normally high and goes low to reset the printer. It can be received anytime during printer operation.

$\overline{\text{ERROR}}$

- This output signal is an "error" or "fault" condition. Normally high, this signal goes low when an error occurs. An error condition can be caused by:
  1. a "Paper Out" condition
  2. the printer is OFF LINE
  3. an overload condition exists

Timing Chart (When normal printing code is received)



T1...0.5 µs (Min)
T2...1 µs (Min)
T3...0.5 µs (Min)
T4...5 µs (Max)
T5...1 ms or less when buffer not full
1 s or less when buffer full

Timing Diagram

9. Maintenance

The printer does not require any routine maintenance. However, reasonable care of the printer will extend its life. The following precautions and periodic measures are recommended:

Precautions

- Keep all liquids away from the printer. Accidental spillage of a liquid into the printer can cause severe damage.

- Do not block the air flow around the printer. Do not place books, paper, or other items on top of the printer.

- Special care should be taken to protect the printer if it is used in an unfriendly environment such as a machine shop, a dusty or sandy area, etc.

- The life of the print head can be extended by observing a few simple precautions.

  —Do not operate the printer without paper and a ribbon cassette installed.

  —Avoid continuous use of the same pins (underline, semi-graphics, etc.) without allowing the print head time to cool.

  —Do not obstruct the movement of the print head while in operation.

- If the printer is not going to be used for an extended period, unplug the power cord.

Periodic Maintenance

- Cleaning the unit the most important action the user can perform. The frequency of cleaning is dependent upon the environment.

  —Turn the power OFF.

  —Clean the case and covers with a soft cloth. Use any mild commercial cleaner on the cloth, do not spray directly on to printer.

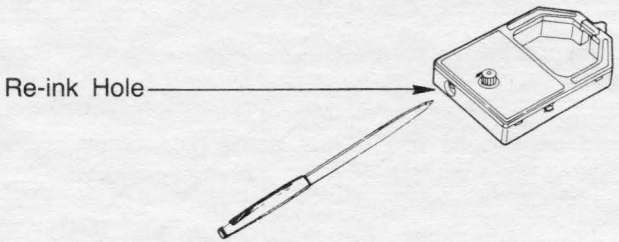
—Remove the top and the smoked plastic covers. Vacuum or dust the inside area of the unit. Be very careful not to damage the flex ribbon cable and the carriage drive belt.

—The platen should be cleaned with denatured alcohol only.

—The carriage guide bar can be lubricated with a very light oil.

Ribbon Cassette

A single ribbon permits the printing of about 3 million characters. When the printing starts to fade, gently push the counter spring in the ribbon cassette hole with the tip of a ballpoint pen or other object. Once the ribbon cassette is mounted onto the carriage and printing is performed for a short time, the characters become darker.



Notes:

- Do not re-ink the ribbon before printing starts to fade. If the ribbon has too much ink the characters may smear when printed.
- Wear and tear of the print head pins may cause serious damage of the ribbon and printing to fade. In such case the printer needs servicing.

Troubleshooting

Most problems associated with the printer can be traced to improper setup, installation, or cabling. Table 9.1 on next page will assist the user in identifying and correcting some of the more common problems. If you need additional help, contact the store from which the unit was purchased.

SYMPTOM	POSSIBLE CAUSE	PROBABLE SOLUTION
Printer does not power up	No AC power Fuse blown	Check Power Cord Replace fuse
Power on but printer not printing	Printer not ON LINE Interface cable not connected	Press ON LINE switch Secure connection
Printer won't go ON LINE	Out of Paper;	Replace paper;
Paper out sensor inoperative	*P.O. Disable	*Set P.O. Enable
Paper slips around platen	Paper feed selector in "T PULL" position	Set selector to "F" or "T PUSH" position
Head moves but does not print	Ribbon not installed correctly	Re-insert ribbon
Paper wrinkles when using tractor feed	No reverse tension on paper. Selector switch is in "F" position.	Set paper supply lower than printer. Set selector to "T" position
Cannot change form length	*Cut sheet feeder is ON	*Set CSF to OFF
Printout double-spaced	*Auto LF is ON	*Set Auto LF as required
Cannot print ASCII characters with code above 127	*Data length set incorrectly	*Set Data length as required
Wrong character set printed	*Wrong character set selected	*Set the character set as required
Cannot change print mode from computer	*FONT and PITCH modes are set incorrectly	*Set to PGM mode Normal condition

Table 9.1 Troubleshooting (* in the Initial Setup modes.)

Appendix A

Epson LQ-2500 Italic Character Set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	'	p			SP	*0*	*@*	*P*	*'*	*p*
1		DC1	!	1	A	Q	a	q		DC1	*!*	*1*	*A*	*Q*	*a*	*q*
2		DC2	"	2	B	R	b	r		DC2	*"*	*2*	*B*	*R*	*b*	*r*
3		DC3	#	3	C	S	c	s		DC3	*#*	*3*	*C*	*S*	*c*	*s*
4		DC4	$	4	D	T	d	t		DC4	*$*	*4*	*D*	*T*	*d*	*t*
5			%	5	E	U	e	u			*%*	*5*	*E*	*U*	*e*	*u*
6			&	6	F	V	f	v			*&*	*6*	*F*	*V*	*f*	*v*
7	BEL		'	7	G	W	g	w	BEL		*'*	*7*	*G*	*W*	*g*	*w*
8	BS	CAN	(	8	H	X	h	x	BS	CAN	*(*	*8*	*H*	*X*	*h*	*x*
9	HT	EM	)	9	I	Y	i	y	HT	EM	*)*	*9*	*I*	*Y*	*i*	*y*
A	LF		*	:	J	Z	j	z	LF		***	*:*	*J*	*Z*	*j*	*z*
B	VT	ESC	+	;	K	[	k	{	VT	ESC	*+*	*;*	*K*	*[*	*k*	*{*
C	FF	FS	,	<	L	\	l	|	FF	FS	*,*	*<*	*L*	**	*l*	*/*
D	CR		−	=	M	]	m	}	CR		*−*	*=*	*M*	*]*	*m*	*}*
E	SO		.	>	N	^	n	~	SO		*.*	*>*	*N*	*^*	*n*	*~*
F	SI		/	?	O	_	o	DEL	SI		*/*	*?*	*O*	*_*	*o*	*DEL*

Epson LQ-2500 Graphic Character Set 1

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	'	p			á				α	≡
1		DC1	!	1	A	Q	a	q		DC1	í				β	±
2		DC2	"	2	B	R	b	r		DC2	ó				Γ	≥
3		DC3	#	3	C	S	c	s		DC3	ú				π	≤
4		DC4	$	4	D	T	d	t		DC4	ñ				Σ	
5		§	%	5	E	U	e	u			Ñ				σ	
6			&	6	F	V	f	v			a				μ	÷
7	BEL		'	7	G	W	g	w	BEL		o				τ	≈
8	BS	CAN	(	8	H	X	h	x	BS	CAN	¿				Φ	°
9	HT	EM	)	9	I	Y	i	y	HT	EM					θ	•
A	LF		*	:	J	Z	j	z	LF						Ω	·
B	VT	ESC	+	;	K	[	k	{	VT	ESC	½				δ	√
C	FF	FS	,	<	L	\	l	|	FF	FS	¼				∞	n
D	CR		–	=	M	]	m	}	CR		¡				ø	2
E	SO		.	>	N	^	n	~	SO		<<				∈	■
F	SI		/	?	O	_	o	DEL	SI		>>				∩	SP

Appendix A

Epson LQ-2500 Graphic Character Set 2

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	'	p	Ç	É	á	▒	└	╨	α	≡
1		DC1	!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2		DC2	"	2	B	R	b	r	é	Æ	ó	▒	┬	╥	Γ	≥
3		DC3	#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4		DC4	$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5		§	%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	å	û	ª	╢	╞	╓	μ	÷
7	BEL		'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8	BS	CAN	(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9	HT	EM	)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	θ	•
A	LF		*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B	VT	ESC	+	;	K	[	k	{	ï	¢	½	╗	╦	■	δ	√
C	FF	FS	,	<	L	\	l	|	î	£	¼	╝	╠	▐	∞	ⁿ
D	CR		–	=	M	]	m	}	ì	¥	¡	╜	═	▌	ø	²
E	SO		.	>	N	^	n	~	Ä	Pt	<<	╛	╬	▄	∈	■
F	SI		/	?	O	_	o	DEL	Å	ƒ	>>	┐	╧	▀	∩	SP

IBM Proprinter X24 Character Set 1

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	`	p			á	▒	└	╨	α	≡
1		DC1	!	1	A	Q	a	q		DC1	í	▒	┴	╤	ß	±
2		DC2	"	2	B	R	b	r		DC2	ó	▒	┬	╥	Γ	≥
3			#	3	C	S	c	s			ú	▒	├	╙	π	≤
4		DC4	$	4	D	T	d	t		DC4	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u			Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v			ª	╢	╞	╓	µ	÷
7	BEL		'	7	G	W	g	w	BEL		º	╖	╟	╫	τ	≈
8	BS	CAN	(	8	H	X	h	x	BS	CAN	¿	╕	╚	╪	Φ	°
9	HT		)	9	I	Y	i	y	HT		⌐	╣	╔	┘	θ	∙
A	LF		*	:	J	Z	j	z	LF		¬	▒	╩	┌	Ω	·
B	VT	ESC	+	;	K	[	k	{	VT	ESC	½	╗	╦	▒	δ	√
C	FF		,	<	L	\	l	|	FF		¼	╝	╠	▒	∞	ⁿ
D	CR		−	=	M	]	m	}	CR		¡	╜	═	▒	ø	²
E	SO		.	>	N	^	n	~	SO		«	╛	╬	▒	ε	■
F	SI		/	?	O	_	o		SI		»	┐	╧	▒	∩	SP

Appendix A

IBM Proprinter X24 Character Set 2

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL		SP	0	@	P	`	p	Ç	É	á	▒	└	╨	α	≡
1		DC1	!	1	A	Q	a	q	ü	æ	í	▓	┴	╤	ß	±
2		DC2	"	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3	♥		#	3	C	S	c	s	â	ô	ú	▓	├	╙	π	≤
4	♦	DC4	$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6	♠		&	6	F	V	f	v	å	û	ª	╢	╞	╓	µ	÷
7	BEL		'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8	BS		(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9	HT		)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	θ	•
A	LF		*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B	VT	ESC	+	;	K	[	k	{	ï	¢	½	╗	╦	■	δ	√
C	FF		,	<	L	\	l	|	î	£	¼	╝	╠	▌	∞	ⁿ
D	CR		–	=	M	]	m	}	ì	¥	¡	╜	═	▐	ø	²
E	SO		.	>	N	^	n	~	Ä	Pts	<<	╛	╬	▀	ε	■
F	SI		/	?	O	_	o		Å	ƒ	>>	┐	╧		∩	SP

IBM Proprinter X24 All Character Chart

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	Ø	▶	SP	0	@	P	`	p	Ç	É	á	▒	└	╨	α	≡
1	☺	◀	!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	ß	±
2	☻	↕	"	2	B	R	b	r	é	Æ	ó	▒	┬	╥	Γ	≥
3	♥	‼	#	3	C	S	c	s	â	ô	ú	▒	├	╙	π	≤
4	♦	¶	$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	û	Ñ	╡	┼	╒	σ	⌡
6	♠	-	&	6	F	V	f	v	å	û	ª	╢	╞	╓	µ	÷
7	•	↨	'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8	◘	↑	(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9	○	↓	)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	θ	•
A	◙	→	*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B	♂	←	+	;	K	[	k	{	ï	¢	½	╗	╦	▉	δ	√
C	♀	└	,	<	L	\	l	|	î	£	¼	╝	╠	▊	∞	ⁿ
D	♪	↔	–	=	M	]	m	}	ì	¥	i	╜	═	▋	ø	²
E	♫	▲	.	>	N	^	n	~	Ä	Pts	<<	╛	╬	▌	ε	■
F	☼	▼	/	?	O	_	o	⌂	Å	ƒ	>>	┐	═	▐	∩	SP

Appendix A

International Character Set

	n	35D 23H	36D 24H	64D 40H	91D 5BH	92D 5CH	93D 5DH	94D 5EH	96D 60H	123D 7BH	124D 7CH	125D 7DH	126D 7EH	155D 9BH	157D 9DH
USA	0	#	$	@	[	\	]	^	`	{	¦	}	~	¢	¥
FRANCE	1	#	$	à	°	ç	§	^	`	é	ù	è	¨	¢	¥
GERMANY	2	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß	¢	¥
ENGLAND	3	£	$	@	[	\	]	^	`	{	¦	}	~	¢	¥
DENMARK I	4	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~	ø	Ø
SWEDEN	5	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü	¢	¥
ITALY	6	#	$	@	°	\	é	^	ù	à	ò	è	ì	¢	¥
SPAIN I	7	Pt	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~	¢	¥
JAPAN	8	#	$	@	[	¥	]	^	`	{	¦	}	~	¢	¥
NORWAY	9	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü	ø	Ø
DENMARK II	10	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü	ø	Ø
SPAIN II	11	#	$	á	¡	Ñ	¿	é	`	í	ñ	ó	ú	¢	¥
LATIN AMERICA	12	#	$	á	¡	Ñ	¿	é	ü	í	ñ	ó	ú	¢	¥
							*1							*2	

Notes:

*1 These characters can be changed only in the LQ-2500 mode. If in the IBM Proprinter X24 mode, International Character Set is set to USA and it can not be changed.

*2 These characters are effective in both graphic character set 2 of the Epson LQ-2500 and IBM Proprinter X24 modes.

Appendix B

Proportional Spacing Tables

ASCII Characters

Epson LQ-2500 mode characters

ASCII cord	Char.	Width	
		Normal	Script
0	à	30	20
1	è	30	20
2	ù	36	24
3	ò	30	20
4	ì	18	12
5	°	24	16
6	£	30	20
7	¡	30	20
8	¿	30	20
9	Ñ	36	24
10	ñ	36	24
11	¤	30	20
12	Pt	42	28
13	À	36	24
14	â	30	20
15	ç	30	20
16	§	30	20
17	ß	36	24
18	Æ	42	28
19	æ	42	28
20	Ø	36	24
21	ø	30	20
22	¨	30	20
23	Ä	36	24
24	Ö	36	24
25	Ü	42	28
26	ä	30	20
27	ö	30	20
28	ü	36	24
29	É	36	24
30	é	30	20
31	¥	36	24
32	SPACE	30	20
33	!	18	12
34	"	30	20
35	#	30	20
36	$	30	20
37	%	36	24
38	&	36	24
39	'	18	12
40	(	24	16
41	)	24	16
42	*	30	20
43	+	30	20

ASCII cord	Char.	Width	
		Normal	Script
44	,	18	12
45	–	30	20
46	.	18	12
47	/	30	20
48	0	30	20
49	1	30	20
50	2	30	20
51	3	30	20
52	4	30	20
53	5	30	20
54	6	30	20
55	7	30	20
56	8	30	20
57	9	30	20
58	:	18	12
59	;	18	12
60	<	30	20
61	=	30	20
62	>	30	20
63	?	30	20
64	@	36	24
65	A	36	24
66	B	36	24
67	C	36	24
68	D	36	24
69	E	36	24
70	F	36	24
71	G	36	24
72	H	36	24
73	I	24	16
74	J	30	20
75	K	36	24
76	L	36	24
77	M	42	28
78	N	36	24
79	O	36	24
80	P	36	24
81	Q	36	24
82	R	36	24
83	S	36	24
84	T	36	24
85	U	42	28
86	V	36	24
87	W	42	28

ASCII cord	Char.	Width	
		Normal	Script
88	X	36	24
89	Y	36	24
90	Z	30	20
91	[	24	16
92	\	30	20
93	]	24	16
94	^	30	20
95	_	30	24
96	`	18	12
97	a	30	20
98	b	36	24
99	c	30	20
100	d	36	24
101	e	30	20
102	f	24	16
103	g	36	24
104	h	36	24
105	i	18	12
106	j	24	16
107	k	36	24
108	l	18	12
109	m	42	28
110	n	36	24
111	o	30	20
112	p	36	24
113	q	36	24
114	r	30	20
115	s	30	20
116	t	24	16
117	u	36	24
118	v	36	24
119	w	42	28
120	x	30	20
121	y	36	24
122	z	30	20
123	{	24	16
124	¦	18	12
125	}	24	16
126	~	30	20
127	⌂	30	20

Unit: 1/360 inch (0.07 mm)

Appendix B

IBM Proprinter X24 mode characters

ASCII cord	Char.	Width	
		Normal	Script
32	SPACE	30	
33	!	30	
34	"	30	
35	#	30	
36	$	30	
37	%	30	
38	&	36	
39	'	18	
40	(	30	
41	)	30	
42	*	30	
43	+	30	
44	,	30	
45	–	30	
46	.	30	
47	/	30	
48	0	30	
49	1	30	
50	2	30	
51	3	30	
52	4	30	
53	5	30	
54	6	30	
55	7	30	
56	8	30	
57	9	30	
58	:	30	
59	;	30	
60	<	30	
61	=	30	
62	>	30	
63	?	30	
64	@	30	
65	A	42	
66	B	42	
67	C	42	
68	D	42	
69	E	36	
70	F	36	
71	G	42	
72	H	42	
73	I	24	
74	J	30	
75	K	42	

ASCII cord	Char.	Width	
		Normal	Script
76	L	36	
77	M	42	
78	N	42	
79	O	42	
80	P	36	
81	Q	42	
82	R	42	
83	S	36	
84	T	42	
85	U	42	
86	V	42	
87	W	42	
88	X	42	
89	Y	42	
90	Z	36	
91	[	30	
92	\	30	
93	]	30	
94	^	30	
95	_	30	
96	`	30	
97	a	30	
98	b	36	
99	c	30	
100	d	36	
101	e	30	
102	f	24	
103	g	36	
104	h	36	
105	i	18	
106	j	18	
107	k	36	
108	l	18	
109	m	42	
110	n	36	
111	o	30	
112	p	36	
113	q	36	
114	r	30	
115	s	30	
116	t	24	
117	u	36	
118	v	36	
119	w	42	

ASCII cord	Char.	Width	
		Normal	Script
120	x	36	
121	y	36	
122	z	30	
123	{	30	
124	¦	30	
125	}	30	
126	~	30	

Unit: 1/360 inch (0.07 mm)

IBM Graphic Characters

Epson LQ-2500 mode characters

ASCII cord	Char.	Width	
		Normal	Script
21	§	30	20
128	Ç	36	24
129	ü	36	24
130	é	30	20
131	â	30	20
132	ä	30	20
133	à	30	20
134	å	30	20
135	ç	30	20
136	ê	30	20
137	ë	30	20
138	è	30	20
139	ï	18	12
140	î	18	12
141	ì	18	12
142	Ä	36	24
143	Å	36	24
144	É	36	24
145	æ	42	28
146	Æ	42	28
147	ô	30	20
148	ö	30	20
149	ò	30	20
150	û	36	24
151	ù	36	24
152	ÿ	36	24
153	Ö	36	24
154	Ü	42	28
155	¢	30	20
156	£	30	20
157	¥	36	24
158	Pt	42	28
159	*f*	30	20
160	á	30	20
161	í	18	12
162	ó	30	20
163	ú	36	24
164	ñ	36	24
165	Ñ	36	24
166	a	30	20
167	o	30	20
168	¿	30	20

ASCII cord	Char.	Width	
		Normal	Script
169	⌐	30	20
170	¬	30	20
171	½	30	20
172	¼	30	20
173	¡	18	12
174	«	30	20
175	»	30	20
224	α	30	20
225	β	30	20
226	Γ	30	20
227	π	30	20
228	Σ	30	20
229	σ	30	20
230	μ	30	20
231	τ	30	20
232	Φ	30	20
233	θ	30	20
234	Ω	30	20
235	δ	30	20
236	∞	36	24
237	φ	30	20
238	∩	30	20
239	≡	30	20
240	∈	30	20
241	±	30	20
242	≥	30	20
243	≤	30	20
246	÷	30	20
247	≈	30	20
248	°	30	20
249	•	30	20
250	·	30	20
251	√	30	20
252	^{n}	30	20
253	^{2}	30	20
254	■	30	20
255	SP	30	20

Unit: 1/360 inch (0.07 mm)

Appendix B

IBM Proprinter X24 mode characters

ASCII cord	Char.	Width	
		Normal	Script
0	Ø	30	
1	☺	30	
2	●	30	
3	♥	30	
4	◆	30	
5	♣	30	
6	♠	30	
7	•	30	
8	◘	30	
9	○	30	
10	◙	30	
11	♂	30	
12	♀	30	
13	♪	30	
14	♫	30	
15	☼	30	
16	►	30	
17	◄	30	
18	↕	30	
19	‼	30	
20	¶	30	
21	§	30	
22	▬	30	
23	↨	30	
24	↑	30	
25	↓	30	
26	→	30	
27	←	30	
28	∟	30	
29	↔	30	
30	▲	30	
31	▼	30	
127	⌂	30	
128	Ç	42	
129	ü	36	
130	é	30	
131	â	30	
132	ä	30	
133	à	30	
134	å	30	
135	ç	30	
136	ê	30	
137	ë	30	
138	è	30	
139	ï	18	

ASCII cord	Char.	Width	
		Normal	Script
140	î	18	
141	ì	18	
142	Ä	36	
143	Å	36	
144	É	36	
145	æ	42	
146	Æ	42	
147	ô	30	
148	ö	30	
149	ò	30	
150	û	36	
151	ù	36	
152	ÿ	36	
153	Ö	36	
154	Ü	42	
155	¢	30	
156	£	30	
157	¥	36	
158	Pts	42	
159	ƒ	30	
160	á	30	
161	í	18	
162	ó	30	
163	ú	36	
164	ñ	36	
165	Ñ	36	
166	a	30	
167	o	30	
168	¿	30	
169	⌐	30	
170	¬	30	
171	½	30	
172	¼	30	
173	¡	30	
174	<<	42	
175	>>	42	
224	α	30	
225	ß	36	
226	Γ	36	
227	π	36	
228	Σ	42	
229	σ	36	
230	μ	36	

ASCII cord	Char.	Width	
		Normal	Script
231	τ	30	
232	Φ	42	
233	θ	42	
234	Ω	42	
235	δ	30	
236	∞	30	
237	φ	42	
238	ε	30	
239	∩	30	
240	≡	30	
241	±	30	
242	≥	30	
243	≤	30	
246	÷	30	
247	≈	30	
248	°	30	
249	●	30	
250	·	30	
251	√	30	
252	n	30	
253	2	30	
254	■	30	
255	SP	30	

Unit: 1/360 inch (0.07 mm)

Appendix C

Structure of an Index table entry

10 cpi draft font

Address	Data
8010	40
8011	D3454A090000000000
801A	D3634A090000000000
8023	D3814A090000000000
802C	D39F4A090000000000
8035	D3BD4A090000000000
803E	D3DB4A090000000000
8047	D3F94A090000000000
8050	D41748090000000000
8059	D42F48090000000000
8062	D44748090000000000
806B	D45F4A090000000000
8074	D47D48090000000000
807D	D4954A090000000000
8086	D4B34A090000000000
808F	D4D14A090000000000
8098	D4EF4A090000000000
80A1	D50D4A090000000000
80AA	D52B4A090000000000
80B3	D5494A090000000000
80BC	D56749090000000000
80C5	D58249090000000000
80CE	D59D48090000000000
80D7	D5B546090000000000
80E0	D5C74A090000000000
80E9	D5E54A090000000000
80F2	D6034A090000000000
80FB	D62149090000000000
8104	D63C49090000000000
810D	D65746090000000000
8116	D66948090000000000
811F	D6814A090000000000
8128	D69F4A090000000000
8131	D6BD42090000000000
813A	D6C346090000000000
8143	D6D546090000000000
814C	D6E749090000000000
8155	D7024A090000000000
815E	D7204A090000000000
8167	D73E4A090000000000
8170	D75C44090000000000
8179	D76847090000000000
8182	D77D47090000000000
818B	D7924A090000000000
8194	D7B048090000000000
819D	D7C846090000000000
81A6	D7DA46090000000000
81AF	D7EC46090000000000
81B8	D7FE4A090000000000
81C1	D81C48090000000000
81CA	D83446090000000000
81D3	D8464A090000000000
81DC	D86448090000000000
81E5	D87C49090000000000
81EE	D89749090000000000
81F7	D8B249090000000000
8200	D8CD49090000000000
8209	D8E848090000000000
8212	D9004909000000000
821B	D91B46090000000000
8224	D92D46090000000000
822D	D93F4A090000000000
8236	D95D46090000000000
823F	D96F4A090000000000
8248	D98D4A090000000000
8251	D9AB4A090000000000
825A	D9C94A090000000000
8263	D9E747090000000000
826C	D9FC48090000000000
8275	DA1447090000000000
827E	DA2947090000000000
8287	DA3E47090000000000
8290	DA534A090000000000
8299	DA7145090000000000

82A2	DA8048090000000000
82AB	DA9847090000000000
82B4	DAAD49090000000000
82BD	DAC846090000000000
82C6	DADA4A090000000000
82CF	DAF84A090000000000
82D8	DB1648090000000000
82E1	DB2E47090000000000
82EA	DB434A090000000000
82F3	DB6148090000000000
82FC	DB7948090000000000
8305	DB9146090000000000
830E	DBA348090000000000
8317	DBBB4A090000000000
8320	DBD94A090000000000
8329	DBF74A090000000000
8332	DC154A090000000000
833B	DC334A090000000000
8344	DC5146090000000000
834D	DC634A090000000000
8356	DC8146090000000000
835F	DC934A090000000000
8368	D6BDC3890000000000
8371	DCB147090000000000
837A	DC6480900000000000
8383	DCDE49090000000000
838C	DCF948090000000000
8395	DD1149090000000000
839E	DD2C48090000000000
83A7	DD4448090000000000
83B0	DD5C48090000000000
83B9	DD7449090000000000
83C2	DD8F48090000000000
83CB	DDA749090000000000
83D4	DDC24A090000000000
83DD	DDE046090000000000
83E6	DDF249090000000000
83EF	DE0D49090000000000
83F8	DE2848090000000000
8401	DE4048090000000000
840A	DE5848090000000000

8413	DE7049090000000000
841C	DE8B48090000000000
8425	DEA348090000000000
842E	DEBB49090000000000
8437	DED64A090000000000
8440	DEF44A090000000000
8449	DF124A090000000000
8452	DF304A090000000000
845B	DF4E4A090000000000
8464	DF6C48090000000000
846D	DF8444090000000000
8476	DF9048090000000000
847F	DFA84A090000000000
8488	DFC64A090000000000
8491	DFE44A090000000000
849A	E00249090000000000
84A3	E01D4A090000000000
84AC	E03B4A090000000000
84B5	E05949090000000000
84BE	E0744A090000000000
84C7	E0924A090000000000
84D0	E0B04A090000000000
84D9	E0CE4A090000000000
84E2	E0EC48090000000000
84EB	E1044A090000000000
84F4	E12249090000000000
84FD	E13D4A090000000000
8506	E15B47090000000000
850F	E1704A090000000000
8518	E18E4A090000000000
8521	E1AC48090000000000
852A	E1C44A090000000000
8533	E1E248090000000000
853C	E1FA4A090000000000
8545	E21848090000000000
854E	E2304A090000000000
8557	E24E4A090000000000
8560	E26C4A090000000000
8569	E28A4A090000000000
8572	E2A848090000000000
857B	E2C048090000000000

8584	E2D84A090000000000
858D	E2F64A090000000000
8596	E3144A090000000000
859F	E33249090000000000
85A8	E34D4A090000000000
85B1	E36B4A090000000000
85BA	E38948090000000000
85C3	E3A14A090000000000
85CC	E3BF4A090000000000
85D5	E3DD4A090000000000
85DE	E3FB4A090000000000
85E7	E419490900000000000
85F0	E434480900000000000
85F9	E44C4A090000000000
8602	E46A460900000000000
860B	E47C460900000000000
8614	E48E4A090000000000
861D	E4AC4A090000000000
8626	E4CA460900000000000
862F	E4DC4A090000000000
8638	E4FA4A090000000000
8641	E518C9090000000000
864A	E533C8090000000000
8653	E54BC9090000000000
865C	E566C4490000000000
8665	E572C5490000000000
866E	E581C5490000000000
8677	E590C7490000000000
8680	E5A5C7490000000000
8689	E5BAC5490000000000
8692	E5C9C7490000000000
869B	E5DEC6490000000000
86A4	E5F0C7490000000000
86AD	E605C7490000000000
86B6	E61AC7490000000000
86BF	E62FC5490000000000
86C8	E63EC5490000000000
86D1	E64DC4490000000000
86DA	E659C5490000000000
86E3	E668C5490000000000
86EC	E677C4490000000000
86F5	E683C3490000000000
86FE	E68CC5490000000000
8707	E69BC4490000000000
8710	E6A7C6490000000000
8719	E6B9C6490000000000
8722	E6CBC6490000000000
872B	E6DDC7490000000000
8734	E6F2C7490000000000
873D	E707C6490000000000
8746	E719C3490000000000
874F	E722C7490000000000
8758	E737C5490000000000
8761	E746C7490000000000
876A	E75BC5490000000000
8773	E76AC7490000000000
877C	E77FC6490000000000
8785	E791C4490000000000
878E	E79DC4490000000000
8797	E7A9C6490000000000
87A0	E7BBC7490000000000
87A9	E7D0C5490000000000
87B2	E7DFC5490000000000
87BB	E7EEC4490000000000
87C4	E7FAC3490000000000
87CD	E803C3490000000000
87D6	E80CC5490000000000
87DF	E81BC4490000000000
87E8	E827C3490000000000
87F1	E8304A090000000000
87FA	E84E4A090000000000
8803	E86C460900000000000
880C	E87E480900000000000
8815	E896490900000000000
881E	E8B148090000000000
8827	E8C94A090000000000
8830	E8E748090000000000
8839	E8FF4A090000000000
8842	E91D480900000000000
884B	E935480900000000000
8854	E94D480900000000000
885D	E9654A090000000000

8866	E9834A090000000000
886F	E9A149090000000000
8878	E9BC49090000000000
8881	E9D744090000000000
888A	E9E348090000000000
8893	E9FB4A090000000000
889C	EA194A090000000000
88A5	EA37C7490000000000
88AE	EA4C47090000000000
88B7	EA614A090000000000
88C0	EA7F4A090000000000
88C9	EA9D48090000000000
88D2	EAB548090000000000
88DB	EACD46090000000000
88E4	EADF4A090000000000
88ED	EAFD49090000000000
88F6	EB1849090000000000
88FF	EB3346090000000000
8908	EB4542090000000000

10 cpi LQ font

Address	Data
8911	41
8912	A4145C230000000000
891B	A46859230000000000
8924	A4B35B230000000000
892D	A50459230000000000
8936	A54F5B230000000000
893F	A5A059230000000000
8948	A5EB5B230000000000
8951	A63C48230000000000
895A	A6544D230000000000
8963	A67B50230000000000
896C	A6AB4F230000000000
8975	A6D855230000000000
897E	A71750230000000000
8987	A74757230000000000
8990	A78C54230000000000
8999	A7C856230000000000
89A2	A80A4A230000000000
89AB	A8284A230000000000
89B4	A84656230000000000
89BD	A8884A230000000000
89C6	A8A64D230000000000
89CF	A8CD59230000000000
89D8	A91844230000000000
89E1	A92456230000000000
89EA	A96656230000000000
89F3	A9A856230000000000
89FC	A9EA4E230000000000
8A05	AA144E230000000000
8A0E	AA3E45230000000000
8A17	AA4D58230000000000
8A20	AA955A230000000000
8A29	AAE35A230000000000
8A32	AB3142230000000000
8A3B	AB3748230000000000
8A44	AB4F4E230000000000
8A4D	AB794E230000000000
8A56	ABA355230000000000
8A5F	ABE259230000000000

8A68	AC2D5A230000000000
8A71	AC7B48230000000000
8A7A	AC934C230000000000
8A83	ACB74C230000000000
8A8C	ACDB58230000000000
8A95	AD2346230000000000
8A9E	AD354D230000000000
8AA7	AD5C44230000000000
8AB0	AD6846230000000000
8AB9	AD7A5C230000000000
8AC2	ADCE54230000000000
8ACB	AE0A4A230000000000
8AD4	AE2856230000000000
8ADD	AE6A55230000000000
8AE6	AEA954230000000000
8AEF	AEE551230000000000
8AF8	AF1857230000000000
8B01	AF5D53230000000000
8B0A	AF9654230000000000
8B13	AFD257230000000000
8B1C	B01746230000000000
8B25	B0294E230000000000
8B2E	B05350230000000000
8B37	B08344230000000000
8B40	B08F50230000000000
8B49	B0BF53230000000000
8B52	B0F855230000000000
8B5B	B1375F230000000000
8B64	B1944F230000000000
8B6D	B1C156230000000000
8B76	B2034F230000000000
8B7F	B23049230000000000
8B88	B24B49230000000000
8B91	B26656230000000000
8B9A	B2A84A230000000000
8BA3	B2C646230000000000
8BAC	B2D84E230000000000
8BB5	B30257230000000000
8BBE	B34748230000000000
8BC7	B35F5A230000000000

8BD0	B3AD5B230000000000
8BD9	B3FE54230000000000
8BE2	B43A4C230000000000
8BEB	B45E5B230000000000
8BF4	B4AF53230000000000
8BFD	B4E857230000000000
8C06	B52D4A230000000000
8C0F	B54B50230000000000
8C18	B57B5C230000000000
8C21	B5CF5E230000000000
8C2A	B62956230000000000
8C33	B66B58230000000000
8C3C	B6B358230000000000
8C45	B6FB45230000000000
8C4E	B70A5C230000000000
8C57	B75E45230000000000
8C60	B76D4C230000000000
8C69	AB31C2A30000000000
8C72	B79149230000000000
8C7B	B7AC53230000000000
8C84	B7E553230000000000
8C8D	B81E56230000000000
8C96	B86053230000000000
8C9F	B89954230000000000
8CA8	B8D54B230000000000
8CB1	B8F656230000000000
8CBA	B93858230000000000
8CC3	B9804A230000000000
8CCC	B99E4B230000000000
8CD5	B9BF58230000000000
8CDE	BA074A230000000000
8CE7	BA2554230000000000
8CF0	BA6155230000000000
8CF9	BAA056230000000000
8D02	BAE253230000000000
8D0B	B1B532300000000000
8D14	BB544D230000000000
8D1D	BB7B56230000000000
8D26	BBBD4F230000000000
8D2F	BBEA54230000000000

8D38	BC265A230000000000
8D41	BC7460230000000000
8D4A	BCD458230000000000
8D53	BD1C5D230000000000
8D5C	BD735A230000000000
8D65	BDC14E230000000000
8D6E	BDEB44230000000000
8D77	BDF74E230000000000
8D80	BE214E230000000000
8D89	BE4B5C230000000000
8D92	BE9F5A230000000000
8D9B	BEED56230000000000
8DA4	BF2F58230000000000
8DAD	BF7756230000000000
8DB6	BFB955230000000000
8DBF	BFF856230000000000
8DC8	C03A57230000000000
8DD1	C07F55230000000000
8DDA	C0BE56230000000000
8DE3	C10055230000000000
8DEC	C13F59230000000000
8DF5	C18A50230000000000
8DFE	C1BA52230000000000
8E07	C1F04C230000000000
8E10	C2145E230000000000
8E19	C26E5E230000000000
8E22	C2C84E230000000000
8E2B	C2F258230000000000
8E34	C33A55230000000000
8E3D	C37958230000000000
8E46	C3C156230000000000
8E4F	C4035A230000000000
8E58	C45156230000000000
8E61	C49358230000000000
8E6A	C4DB5C230000000000
8E73	C52F58230000000000
8E7C	C57752230000000000
8E85	C5AD51230000000000
8E8E	C5E057230000000000
8E97	C6255A230000000000
8EA0	C6735B230000000000
8EA9	C6C454230000000000
8EB2	C7005723000000000
8EBB	C7454E230000000000
8EC4	C76F5B230000000000
8ECD	C7C057230000000000
8ED6	C805562300000000000
8EDF	C8475C230000000000
8EE8	C89B552300000000000
8EF1	C8DA542300000000000
8EFA	C916542300000000000
8F03	C952452300000000000
8F0C	C961452300000000000
8F15	C970512300000000000
8F1E	C9A350230000000000
8F27	C9D348230000000000
8F30	C9EB58230000000000
8F39	CA3358230000000000
8F42	CA7BC9230000000000
8F4B	CA96C9230000000000
8F54	CAB1C9230000000000
8F5D	CACCC4630000000000
8F66	CAD8C4630000000000
8F6F	CAE4C4630000000000
8F78	CAF0C6630000000000
8F81	CB02C6630000000000
8F8A	CB14C4630000000000
8F93	CB20C6630000000000
8F9C	CB32C6630000000000
8FA5	CB44C6630000000000
8FAE	CB56C6630000000000
8FB7	CB68C6630000000000
8FC0	CB7AC4630000000000
8FC9	CB86C4630000000000
8FD2	CB92C4630000000000
8FDB	CB9EC4630000000000
8FE4	CBAAC4630000000000
8FED	CBB6C4630000000000
8FF6	CBC2C2630000000000
8FFF	CBC8C4630000000000
9008	CBD4C4630000000000
9011	CBE0C6630000000000

901A	CBF2C6630000000000
9023	CC04C6630000000000
902C	CC16C6630000000000
9035	CC28C6630000000000
903E	CC3AC6630000000000
9047	CC4CC2630000000000
9050	CC52C6630000000000
9059	CC64C4630000000000
9062	CC70C6630000000000
906B	CC82C4630000000000
9074	CC8EC6630000000000
907D	CCA0C6630000000000
9086	CCB2C4630000000000
908F	CCBEC4630000000000
9098	CCCAC6630000000000
90A1	CCDCC6630000000000
90AA	CCEEC4630000000000
90B3	CCFAC4630000000000
90BC	CD06C4630000000000
90C5	CD12C2630000000000
90CE	CD18C2630000000000
90D7	CD1EC3630000000000
90E0	CD27C3630000000000
90E9	CD30C2630000000000
90F2	CD365E230000000000
90FB	CD905A230000000000
9104	CDDE482300000000000
910D	CDF6502300000000000
9116	CE2655230000000000
911F	CE6554230000000000
9128	CEA152230000000000
9131	CED74F230000000000
913A	CF0452230000000000
9143	CF3A582300000000000
914C	CF825A230000000000
9155	CFD056230000000000
915E	D01255230000000000
9167	D05158230000000000
9170	D09951230000000000
9179	D0CC52230000000000
9182	D10244230000000000

918B	D10E46230000000000
9194	D12050230000000000
919D	D15050230000000000
91A6	D180CF630000000000
91AF	D1AD4E230000000000
91B8	D1D748230000000000
91C1	D1EF50230000000000
91CA	D21F52230000000000
91D3	D25548230000000000
91DC	D26D46230000000000
91E5	D27F5E230000000000
91EE	D2D951230000000000
91F7	D30C4D230000000000
9200	D33344230000000000
9209	D33F42230000000000

Appendix C

Proportional Spacing LQ font

Address	Data
9212	43
9213	EB4B5B1D0000000000
921C	A468581D0000000000
9225	A4B35A1D0000000000
922E	A504581D0000000000
9237	A54F5B1D0000000000
9240	A5A0591D0000000000
9249	A5EB5B1D0000000000
9252	A63C481D0000000000
925B	A6544C1D0000000000
9264	A67B501D0000000000
926D	A6AB4E1D0000000000
9276	A6D8551D0000000000
927F	A717501D0000000000
9288	A747561D0000000000
9291	A78C531D0000000000
929A	A7C8551D0000000000
92A3	A80A4A1D0000000000
92AC	A8284A1D0000000000
92B5	A846561D0000000000
92BE	EB9C4A1D0000000000
92C7	EBBA4E1D0000000000
92D0	EBE4581D0000000000
92D9	A918441D0000000000
92E2	A924561D0000000000
92EE	A966561D0000000000
92F4	A9A8561D0000000000
92FD	A9EA4D1D0000000000
9306	AA144E1D0000000000
930F	AA3E451D0000000000
9318	AA4D581D0000000000
9321	AA955A1D0000000000
932A	AAE35A1D0000000000
9333	EC2C421D0000000000
933C	EC32481D0000000000
9345	EC4A4E1D0000000000
934E	EC744E1D0000000000
9357	EC9E551D0000000000
9360	ECDD521D0000000000
9369	ED135A230000000000
9372	ED6148110000000000
937B	ED794C1D0000000000
9384	ED9D4C1D0000000000
938D	EDC1581D0000000000
9396	AD23461D0000000000
939F	EE094D1D0000000000
93A8	EE30441D0000000000
93B1	EE3C461D0000000000
93BA	EE4E5B1D0000000000
93C3	EE9F541D0000000000
93CC	EEDB4A1D0000000000
93D5	EEF9561D0000000000
93DE	EF3B531D0000000000
93E7	EF74531D0000000000
93F0	EFAD541D0000000000
93F9	EFE9571D0000000000
9402	F02E521D0000000000
940B	F064541D0000000000
9414	F0A0571D0000000000
941D	F0E5461D0000000000
9426	F0F74D1D0000000000
942F	B053501D0000000000
9438	B083441D0000000000
9441	B08F501D0000000000
944A	F11E531D0000000000
9453	F157551D0000000000
945C	F19660290000000000
9465	F1F652290000000000
946E	F22C58290000000000
9477	F27452290000000000
9480	F2AA49230000000000
9489	F2C54B230000000000
9492	F2E659290000000000
949B	F3314E290000000000
94A4	F35B4617000000000C
94AD	F36D4E1D000000000C
94B6	F3975C290000000000
94BF	F3EB48230000000000

94C8	F4035E290000000000
94D1	F45D5D290000000000
94DA	F4B45A290000000000
94E3	F5024E230000000000
94EC	F52C5E290000000000
94F5	F58655290000000000
94FE	F5C554230000000000
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952B	F74564290000000000
9534	F7B159290000000000
953D	F7FC59230000000000
9546	F847451D0000000000
954F	F8565B1D0000000000
9558	F8A7451D0000000000
9561	F8B64E1D0000000000
956A	AB31C29D0000000000
9573	F8E0491D0000000000
957C	F8FB531D0000000000
9585	F93452230000000000
958E	F96A531D0000000000
9597	F9A353230000000000
95A0	F9DC541D0000000000
95A9	FA184C170000000000
95B2	FA3C53230000000000
95BB	FA7556230000000000
95C4	FAB745110000000000
95CD	FAC64B110000000000
95D6	FAE753230000000000
95DF	FB2046110000000000
95E8	FB3258290000000000
95F1	FB7A53230000000000
95FA	FBB3541D0000000000
9603	FBEF53230000000000
960C	FC2853230000000000
9615	FC61501D0000000000
961E	FC91521D0000000000
9627	FCC749170000000000
9630	FCE254230000000000
9639	FD1E5A230000000000
9642	FD6C61290000000000
964B	FDCF58230000000000
9654	FE175D230000000000
965D	FE6E581D0000000000
9666	FEB64E1D0000000000
966F	FEE0441D0000000000
9678	FEEC4E1D0000000000
9681	FF164E1D0000000000
968A	BE4B5C1D0000000000
9693	FF405B290000000000
969C	4FFF56230000000000
96A5	5041591D0000000000
96AE	508C571D0000000000
96B7	50D1541D0000000000
96C0	510D571D0000000000
96C9	5152551D0000000000
96D2	5191561D0000000000
96DB	51D3571D0000000000
96E4	5218551D0000000000
96ED	5257581D0000000000
96F6	529F4B110000000000
96FF	52C04E110000000000
9708	52EA4A110000000000
9711	530862290000000000
971A	536E60290000000000
9723	53CE4F230000000000
972C	53FB5D290000000000
9735	545259290000000000
973E	549D581D0000000000
9747	54E5541D0000000000
9750	5521581D0000000000
9759	556957230000000000
9762	55AE56230000000000
976B	5F05D2300000000000
9774	56475B290000000000
977D	569859290000000000
9786	56E3551D0000000000
978F	5722551D0000000000
9798	5761581D0000000000
97A1	57A95F290000000000

97AA	5806531D0000000000
97B3	583F571D0000000000
97BC	588449110000000000
97C5	589F591D0000000000
97CE	58EA57230000000000
97D7	592F56230000000000
97E0	597160290000000000
97E9	59D1551D0000000000
97F2	5A10541D0000000000
97FB	5A4C531D0000000000
9804	C952451D0000000000
980D	C961451D0000000000
9816	5A85511D0000000000
981F	5AB8501D0000000000
9828	5AE8481D0000000000
9831	5B005A290000000000
983A	5B4E5A290000000000
9843	7C09C51D0000000000
984C	7C18C51D0000000000
9855	7C27C31D0000000000
985E	CACCC45D0000000000
9867	CAD8C45D0000000000
9870	CAE4C45D0000000000
9879	CAF0C65D0000000000
9882	CB02C65D0000000000
988B	CB14C45D0000000000
9894	CB20C65D0000000000
989D	CB32C65D0000000000
98A6	CB44C65D0000000000
98AF	CB56C65D0000000000
98B8	CB68C65D0000000000
98C1	CB7AC45D0000000000
98CA	CB86C45D0000000000
98D3	CB92C45D0000000000
98DC	CB9EC45D0000000000
98E5	CBAAC45D0000000000
98EE	CBB6C45D0000000000
98F7	CBC2C25D0000000000
9900	CBC8C45D0000000000
9909	CBD4C45D0000000000
9912	CBE0C65D0000000000

991B	CBF2C65D0000000000
9924	CC04C65D0000000000
992D	CC16C65D0000000000
9936	CC28C65D0000000000
993F	CC3AC65D0000000000
9948	CC4CC25D0000000000
9951	CC52C65D0000000000
995A	CC64C45D0000000000
9963	CC70C65D0000000000
996C	CC82C45D0000000000
9975	CC8EC65D0000000000
997E	CCA0C65D0000000000
9987	CCB2C45D0000000000
9990	CCBEC45D0000000000
9999	CCCAC65D0000000000
99A2	CCDCC65D0000000000
99AB	CCEEC45D0000000000
99B4	CCFAC45D0000000000
99BD	CD06C45D0000000000
99C6	CD12C25D0000000000
99CF	CD18C25D0000000000
99D8	CD1EC35D0000000000
99E1	CD27C35D0000000000
99EA	CD30C25D0000000000
99F3	5B9C5E1D0000000000
99FC	5BF65A230000000000
9A05	5C4448230000000000
9A0E	5C5C50230000000000
9A17	5C8C5A290000000000
9A20	5CDA54230000000000
9A29	5D1652230000000000
9A32	5D4C4D1D0000000000
9A3B	5D7356290000000000
9A44	5DB55A290000000000
9A4D	5E035A290000000000
9A56	5E51561D0000000000
9A5F	D012541D0000000000
9A68	5E9358290000000000
9A71	5EDB511D0000000000
9A7A	D0CC521D0000000000
9A83	D102441D0000000000

9A8C	D10E461D0000000000
9A95	D120501D0000000000
9A9E	D150501D0000000000
9AA7	D180CF5D0000000000
9AB0	D1AD4E1D0000000000
9AB9	D1D7481D0000000000
9AC2	D1EF501D0000000000
9ACB	D21F521D0000000000
9AD4	D255481D0000000000
9ADD	D26D461D0000000000
9AE6	D27F5E1D0000000000
9AEF	5F0E511D0000000000
9AF8	5F414D1D0000000000
9B01	D333441D0000000000
9B0A	5F68421D0000000000

12 cpi LQ font

Address	Data
9B13	02
9B14	5F6E581D0000000000
9B1D	A468581D0000000000
9B26	A4B35A1D0000000000
9B2F	A504581D0000000000
9B38	A54F5B1D0000000000
9B41	A5A0591D0000000000
9B4A	A5EB5B1D0000000000
9B53	A63C481D0000000000
9B5C	A6544C1D0000000000
9B65	A67B501D0000000000
9B6E	A6AB4E1D0000000000
9B77	A6D8551D0000000000
9B80	A717501D0000000000
9B89	A747561D0000000000
9B92	A78C531D0000000000
9B9B	A7C8551D0000000000
9BA4	A80A4A1D0000000000
9BAD	A8284A1D0000000000
9BB6	A846561D0000000000
9BBF	5FB64E1D0000000000
9BC8	5FE04D1D0000000000
9BD1	6007531D0000000000
9BDA	A918441D0000000000
9BE3	A924561D0000000000
9BEC	A966561D0000000000
9BF5	A9A8561D0000000000
9BFE	A9EA4D1D0000000000
9C07	AA144E1D0000000000
9C10	AA3E451D0000000000
9C19	AA4D581D0000000000
9C22	AA955A1D0000000000
9C2B	AAE35A1D0000000000
9C34	AB31421D0000000000
9C3D	6040481D0000000000
9C46	60584E1D0000000000
9C4F	6082551D0000000000
9C58	60C1541D0000000000
9C61	60FD5C1D0000000000

9C6A	6151591D0000000000
9C73	619C481D0000000000
9C7C	61B44E1D0000000000
9C85	61DE4E1D0000000000
9C8E	6208571D0000000000
9C97	AD23461D0000000000
9CA0	624D481D0000000000
9CA9	6265441D0000000000
9CB2	6271461D0000000000
9CBB	6283501D0000000000
9CC4	62B3501D0000000000
9CCD	62E3461D0000000000
9CD6	62F5571D0000000000
9CDF	633A4F1D0000000000
9CE8	6367531D0000000000
9CF1	63A04F1D0000000000
9CFA	63CD551D0000000000
9D03	640C531D0000000000
9D0C	6445551D0000000000
9D15	6484551D0000000000
9D1E	64C3461D0000000000
9D27	64D5481D0000000000
9D30	B053501D0000000000
9D39	B083441D0000000000
9D42	B08F501D0000000000
9D4B	64ED511D0000000000
9D54	6520571D0000000000
9D5D	65655C1D0000000000
9D66	65B94D1D0000000000
9D6F	65E0501D0000000000
9D78	66104E1D0000000000
9D81	663A4B1D0000000000
9D8A	665B4A1D0000000000
9D93	6679511D0000000000
9D9C	66AC4A1D0000000000
9DA5	66CA481D0000000000
9DAE	66E24E1D0000000000
9DB7	670C531D0000000000
9DC0	67454A1D0000000000
9DC9	6763581D0000000000
9DD2	67AB561D0000000000
9DDB	67ED501D0000000000
9DE4	681D4D1D0000000000
9DED	6844551D0000000000
9DF6	6883501D0000000000
9DFF	68B3511D0000000000
9E08	68E64C1D0000000000
9E11	690A501D0000000000
9E1A	693A591D0000000000
9E23	69855C1D0000000000
9E2C	69D95A1D0000000000
9E35	6A27571D0000000000
9E3E	6A6C581D0000000000
9E47	6AB4451D0000000000
9E50	6AC3501D0000000000
9E59	6AF3451D0000000000
9E62	6B024A1D0000000000
9E6B	AB31C29D0000000000
9E74	6B204A1D0000000000
9E7D	6B3E531D0000000000
9E86	6B77531D0000000000
9E8F	6BB0521D0000000000
9E98	6BE6501D0000000000
9EA1	6C16511D0000000000
9EAA	6C494A1D0000000000
9EB3	6C67561D0000000000
9EBC	6CA9521D0000000000
9EC5	6CDF4B1D0000000000
9ECE	6D004D1D0000000000
9ED7	6D27561D0000000000
9EE0	6D69481D0000000000
9EE9	6D81521D0000000000
9EF2	6DB7521D0000000000
9EFB	6DED521D0000000000
9F04	6E234F1D0000000000
9F0D	6E50501D0000000000
9F16	6E80531D0000000000
9F1F	6EB9501D0000000000
9F28	6EE94A1D0000000000
9F31	6F07501D0000000000

9F3A	6F37591D0000000000
9F43	6F825E1D0000000000
9F4C	6FDC571D0000000000
9F55	70215A1D0000000000
9F5E	706F591D0000000000
9F67	70BA4A1D0000000000
9F70	70D8441D0000000000
9F79	70E44A1D0000000000
9F82	71024D1D0000000000
9F8B	BE4B5C1D0000000000
9F94	7129561D0000000000
9F9D	716B531D0000000000
9FA6	71A4561D0000000000
9FAF	71E6561D0000000000
9FB8	7228571D0000000000
9FC1	726D571D0000000000
9FCA	72B2561D0000000000
9FD3	72F4561D0000000000
9FDC	7336531D0000000000
9FE5	736F531D0000000000
9FEE	73A8531D0000000000
9FF7	73E14E1D0000000000
A000	740B4D1D0000000000
A009	74324D1D0000000000
A012	74595B1D0000000000
A01B	74AA571D0000000000
A024	74EF531D0000000000
A02D	7528591D0000000000
A036	7573541D0000000000
A03F	75AF541D0000000000
A048	75EB521D0000000000
A051	7621571D0000000000
A05A	7666531D0000000000
A063	769F561D0000000000
A06C	76E1581D0000000000
A075	7729521D0000000000
A07E	775F541D0000000000
A087	779B511D0000000000
A090	77CE581D0000000000
A099	78165C1D0000000000
A0A2	786A561D0000000000

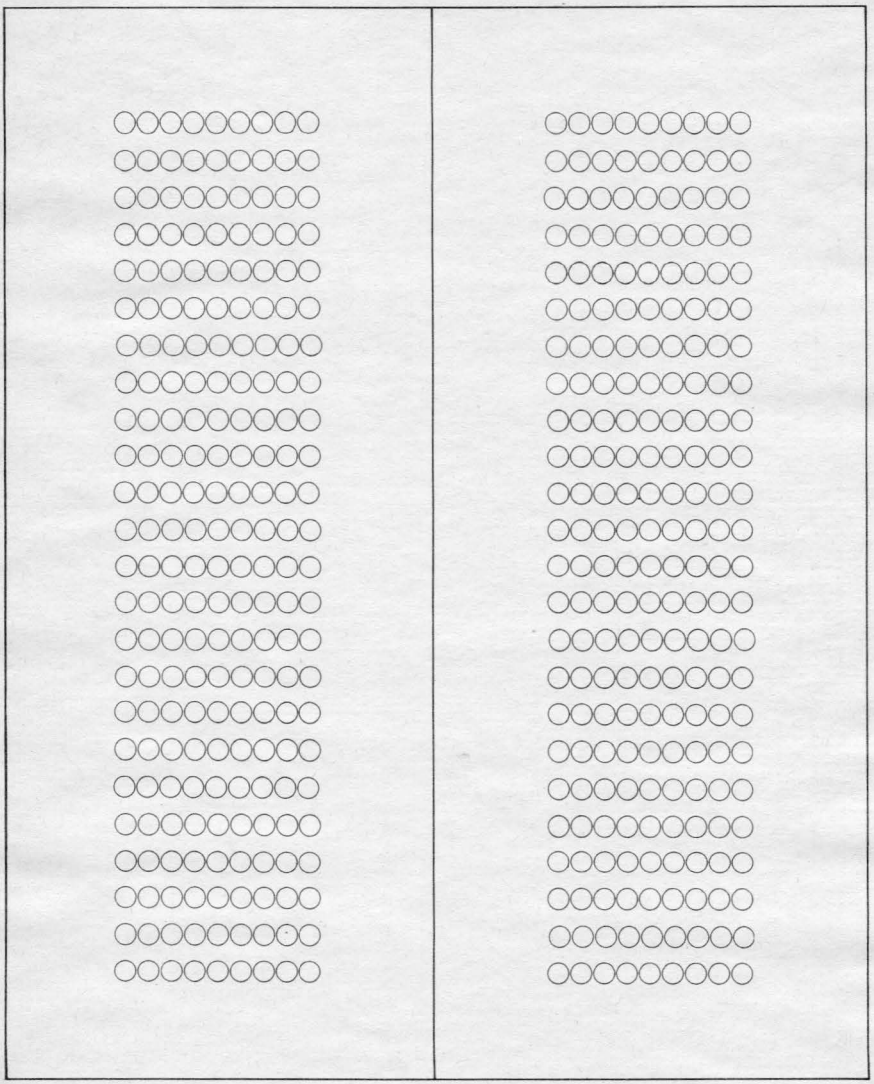
A0AB	78AC541D0000000000
A0B4	78E8571D0000000000
A0BD	792D4E1D0000000000
A0C6	7957571D0000000000
A0CF	799C551D0000000000
A0D8	79DB561D0000000000
A0E1	7A1D581D0000000000
A0EA	7A65541D0000000000
A0F3	7AA1501D0000000000
A0FC	7AD1501D0000000000
A105	C952451D0000000000
A10E	C961451D0000000000
A117	7B01521D0000000000
A120	7B37511D0000000000
A129	7B6A481D0000000000
A132	7B82561D0000000000
A13B	7BC4571D0000000000
A144	7C09C51D0000000000
A14D	7C18C51D0000000000
A156	7C27C31D0000000000
A15F	CACCC45D0000000000
A168	CAD8C45D0000000000
A171	CAE4C45D0000000000
A17A	CAF0C65D0000000000
A183	CB02C65D0000000000
A18C	CB14C45D0000000000
A195	CB20C65D0000000000
A19E	CB32C65D0000000000
A1A7	CB44C65D0000000000
A1B0	CB56C65D0000000000
A1B9	CB68C65D0000000000
A1C2	CB7AC45D0000000000
A1CB	CB86C45D0000000000
A1D4	CB92C45D0000000000
A1DD	CB9EC45D0000000000
A1E6	CBAAC45D0000000000
A1EF	CBB6C45D0000000000
A1F8	CBC2C25D0000000000
A201	CBC8C45D0000000000
A20A	CBD4C45D0000000000
A213	CBE0C65D0000000000

A21C	CBF2C65D0000000000
A225	CC04C65D0000000000
A22E	CC16C65D0000000000
A237	CC28C65D0000000000
A240	CC3AC65D0000000000
A249	CC4CC25D0000000000
A252	CC52C65D0000000000
A25B	CC64C45D0000000000
A264	CC70C65D0000000000
A26D	CC82C45D0000000000
A276	CC8EC65D0000000000
A27F	CCA0C65D0000000000
A288	CCB2C45D0000000000
A291	CCBEC45D0000000000
A29A	CCCAC65D0000000000
A2A3	CCDCC65D0000000000
A2AC	CCEEC45D0000000000
A2B5	CCFAC45D0000000000
A2BE	CD06C45D0000000000
A2C7	CD12C25D0000000000
A2D0	CD18C25D0000000000
A2D9	CD1EC35D0000000000
A2E2	CD27C35D0000000000
A2EB	CD30C25D0000000000
A2F4	7C30581D0000000000
A2FD	7C78551D0000000000
A306	7CB7481D0000000000
A30F	7CCF501D0000000000
A318	7CFF521D0000000000
A321	7D35531D0000000000
A32A	7D6E571D0000000000
A333	7DB3511D0000000000
A33C	7DE6501D0000000000
A345	7E16541D0000000000
A34E	7E52541D0000000000
A357	7E8E541D0000000000
A360	D012541D0000000000
A369	7ECA561D0000000000
A372	7F0C501D0000000000
A37B	D0CC521D0000000000
A384	D102441D0000000000
A38D	D10E461D0000000000
A396	D120501D0000000000
A39F	D150501D0000000000
A3A8	D180CF5D0000000000
A3B1	D1AD4E1D0000000000
A3BA	D1D7481D0000000000
A3C3	D1EF501D0000000000
A3CC	D21F521D0000000000
A3D5	D255481D0000000000
A3DE	D26D461D0000000000
A3E7	D27F5E1D0000000000
A3F0	7F3C501D0000000000
A3F9	7F6C4E1D0000000000
A402	D333441D0000000000
A40B	7F96421D0000000000

Appendix D

Down Line Load Character Matrix Blanks: Draft

24×9

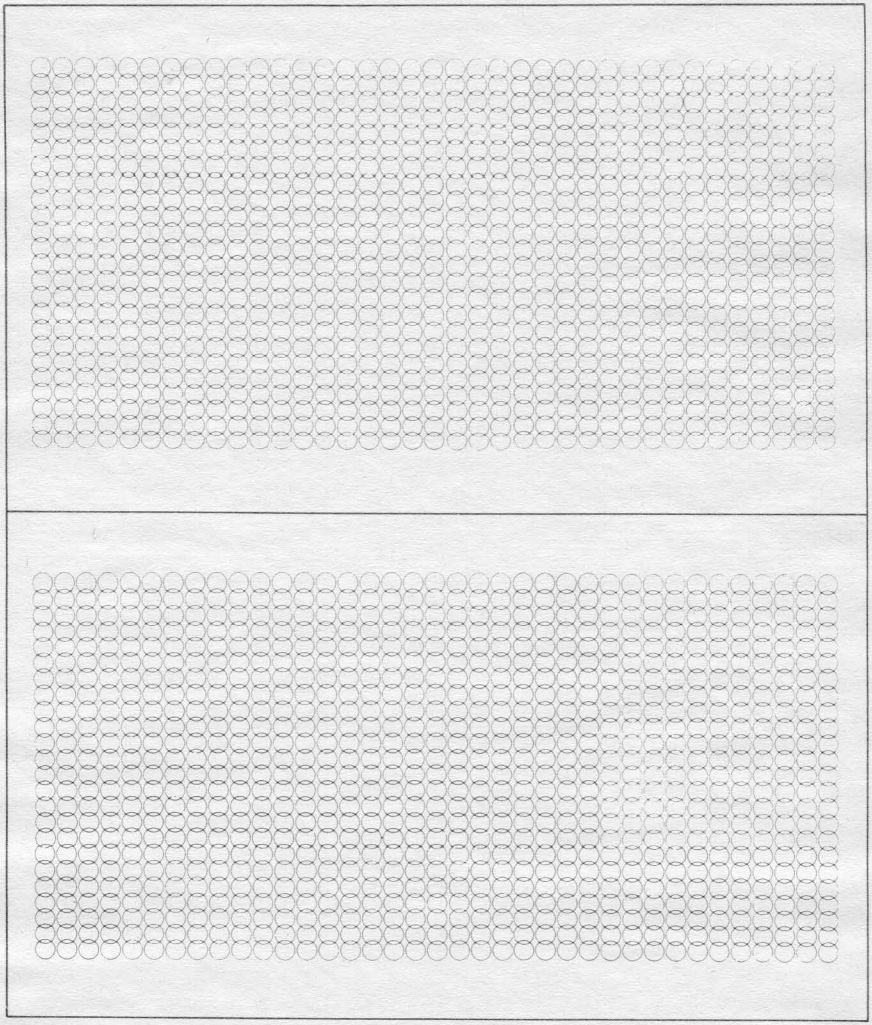


Make copies of this page first.
Then use blank matrices to design your down line load characters.

Appendix D

Down Line Load Character Matrix Blank: LQ

24×37



Make copies of this page first.
Then use blank matrices to design your down line load characters.

Appendix E

Paper

1. Continuous paper

A list of the paper which may be used with this unit is provided below.
Width: 4~10 inches (102~254 mm).
Quality and number of sheets: *only for the last sheet

Type of paper	Sheets	Weight			
		in lbs		in g/m²	
		push	pull	push	pull
Fine-quality paper	1	16~24	14~22	61~90	53~83
Non-carbon	2~4	11~14 (17*)		41~53 (64*)	
Multi-layered with carbon	2	11~14 (17*)		41~53 (64*)	

Notes:
- When using multi-part continuous paper in environments which have very high or low temperature and/or humidity, we recommend the use of the bottom feed pull mode to optimize paper handling and print quality.
- To insure optimum print quality, 16~22 lbs is recommended for graphic printing.
- In multi-layered paper with carbon, the carbon is equivalent to a sheet of paper.
- "Weight in pounds" represents the weight of 500 [17×22 inches (432×559 mm)] sheets.

2. Single Sheet

Width: 4~11.7 inches (102~297 mm)
Height: 5~14.3 inches (127~363 mm)
Weight in pounds (g/m²): 14~24 (53~90 g/m²)

Notes:
- The printer will handle multipart papers up to 0.013 inch (0.32 mm). Up to 4 copies of 14 lb. chemical release paper can be used.
- Paper should be within operating temperature and humidity ranges at least 24 hours prior to use.

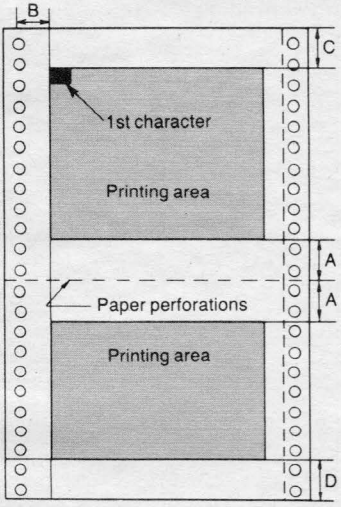
3. Envelope

#10 size envelope is recommended. Since envelopes vary in size, paper weight and construction, we cannot guarantee print quality and paper handling for all types of envelopes.

Appendix F

Printing Area

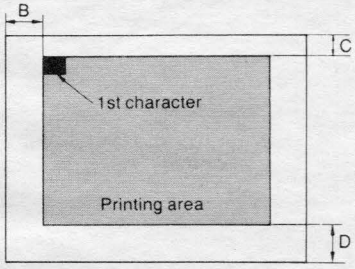
1. Continuous paper



	Push	Pull
A	1″ (25.4 mm)	
B	1″ (25.4 mm)	
C	0.37″ (9.4 mm)	4″ (102 mm)
D	1″ (25.4 mm)	

A: Value A indicates the positions near the paper perforations where the quality may not be optimum.
B: Value B indicates the position where the first character is printed. (When the left tractor is set on the left end.)
C: Value C indicates the area from the top of the paper to the position where the first character is printed.
D: Value D indicates the position where paper out is detected.

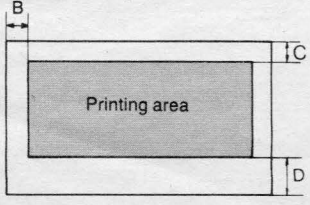
2. Single sheet



	Paper guide	
	Portrait	Landscape
B	¼″ (6.3 mm)	1.5″ (38 mm)
C	0.37″ (9.4 mm)	
D	1″ (25.4 mm)	

B: Value B indicates the position where the first character is printed.
C: Value C indicates the area from the top of the paper to the position where the first character is printed.
D: Value D indicates the position where paper out is detected.

Envelope



Notes:

B: ¼″ (6.3 mm)
C: 0.37″ (9.4 mm)
D: 1″ (25.4 mm)

Index

Software commands of Epson LQ-2500 mode and IBM Proprinter X24 mode descriptions are not indexed here. For page references for Epson LQ-2500 mode commands, see pages 6-1 through 6-5 in Section 6. For IBM Proprinter X24 mode commands, see pages 7-1 through 7-4 in Section 7.

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Appendix G

The functions of EZ Set Operator panel switches in the Function mode.

Panel Switch	Function
FUNCTION	Enters or exits the Function mode
LF	Moves the carriage toward right (when the Control Table is in the RIGHT/LEFT MARGIN position)
	Sets the MACRO #1, 2 or 3 write mode (when the Control Table is in the MACRO #1, 2 or 3 position)
	Not operational when the Control Table is not in the above mentioned positions (If pressed, error sound will occur)
FF	Moves the carriage toward left (when the Control Table is the RIGHT/LEFT MARGIN position)
	Sets the MACRO #1, 2 or 3 read mode (when the Control Table is in the MACRO #1, 2 or 3 position)
	Not operational when the Control Table is not in the above mentioned position (If pressed, error sound will occur)
ON LINE	MEMO LOAD (will load paper if paper is not installed or will "park" paper if paper is installed)
SET	Sets and/or releases current Control Table position
	Performs the read or write of MACRO#1, 2 or 3
	Prints the current setting condition of Control Table when the R1, R2 and R3 indicators are all ON
COLUMN	Advances to the next column position on the Control Table
ROW	Advances to the next row position on the Control Table

Initial Setup Mode

Turn on the power switch while holding down the FUNCTION button. The ON LINE indicator will start blinking. Use the ROW, COLUMN, and SET switches to select the functions in the matrix below. For instance, to select the LQ-2500 emulation, select Row 1, Column 2. (See Page 3-12, Section 3.3, for details.) To save your setting and return to ON LINE mode, press the FUNCTION button.

Row indicator light		Column indicator light					
		C1	C2	C3	C4	C5	C6
1st	ON	LQ-2500 Italic	LQ-2500 Graphic	IBM X24 G1	IBM X24 G2	—	—
2nd	ON ON	Draft	Courier	Prestige	Bold PS	Script	Sans Serif
3rd	ON	U.S.A.	France	Germany	England	Denmark 1	Sweden
4th	ON ON	Italy	Spain 1	Japan	Norway	Denmark 2	Spain 2
5th	ON	Latin America	❶ Print direction	❷ Skip Perforation	❸ Auto LF	❹ Auto CR	❺ Paper Out Detector
6th	ON ON ON	Current condition of Initial Setup mode can be printed by pressing the SET switch.					
7th	BLK	❻ DLL Buffer	❼ Cut Sheet Feeder	❽ Buzzer	❾ Zero Font	❿ AGM	⓫ Data length

Function		Column indicator light	
		ON = LIT	OFF = BLINK
❶	Print Direction	Uni-direction	Bi-direction
❷	Skip Perforation	1 inch skip	No skip
❸	Auto LF	CR+LF	CR only
❹	Auto CR	LF, VT, ESC+J +CR	LF, VT, ESC+J only
❺	Paper Out Detector	Enable	Disable
❻	Down Line Load Buffer control	Enable	Disable
❼	Cut Sheet Feeder	Installed	Not installed
❽	Buzzer	Sound	No sound
❾	Zero Font	Zero (0)	Zero slash (Ø)
❿	Alternate Graphic Mode	AGM is ON	Normal mode
⓫	Data length	7 bit	8 bit

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Cette garantie ne couvre que les défectuosités survenant lors d'un usage normal en cours de service selon les caractéristiques du produit et ne couvre pas les défauts ou défaillances découlant d'une mauvaise utilisation ou de négligence.

Seules les altérations, modifications ou réparations apportées par un réparateur autorisé de Roland DG sont couvertes par cette garantie.

Afin d'obtenir ce service sous garantie, vous devez apporter ou envoyer votre produit soigneusement emballé, sa réexpédition payée d'avance, à un centre de service Roland DG autorisé. Consultez votre détaillant ou votre succursale pour savoir où se trouve le centre de service le plus proche. Pour obtenir ce genre de service sous garantie, vous devez fournir une preuve d'achat sur laquelle figurent le nom du détaillant et la date d'achat.

La garantie s'applique aux appareils suivants:

1 An	traceurs, ordinateurs personnels, télécopieurs, écrans
2 Ans	imprimantes par points

Veuillez conserver votre preuve d'achat!

Centres de service Roland DG:

VANCOUVER	13880 Mayfield Place Richmond, BC, V6V 2E4 604/273-4453
TORONTO	5895 Ambler Drive Mississauga, ON, L4W 2N4 416/624-5944
MONTREAL	9425 Trans Canada St-Laurent, PQ, H4S 1V3 514/332-6371

RENVOYEZ CETTE CARTE AFIN D'OBTENIR LA GARANTIE

Stamp

Timbre

Roland DG Canada Inc.

13880 Mayfield Place

Richmond, BC

V6V 2E4

FOR WARRANTY COVERAGE—MAIL THIS CARD

Product brand name: _____

Product type: Plotter ___ Printer ___ Monitor ___ PC ___ Fax ___

Other (specify) _____

Model No.: _____ Serial No.: _____

Purchase date: _____

Dealer name: _____

Dealer address: _____

_____

City, Prov.: _____ Code: _____

Customer name: _____

Customer title (if applicable): _____

Customer company (if applicable): _____

Customer address: _____

_____

City, Prov.: _____ Code: _____

Telephone (office): _____ (home): _____

Brand and model of computer used: _____

Type of Use: Accounting __ Word Processing __ Database __ CAD/CAM __

Educational __ Home __ Other _____

Marque de l'appareil: _____

Traceur ___ Imprimante ___ Ecran de contrôle ___ PC ___ Télécopieur ___

Autre (précisez) _____

No. du modèle: _____ No. de série: _____

Date d'achat: _____

Nom du détaillant: _____

Adresse: _____

_____

Ville, Province: _____ Code postale _____

Nom du client _____

Compagnie (s'il y a lieu) _____

Titre (s'il y a lieu) _____

Adresse _____

_____

Ville, Province: _____ Code postale _____

Téléphone (résidence): _____ (travail): _____

Marque d'ordinateur utilisé: _____

Emploi: Comptabilité ___ Traitement de texte ___ Base de données ___ CAO ___

Educatif ___ Maison ___ Autre _____

TECHNICAL SUPPORT

Call the office nearest to you between 8:30 a.m. and 5:00 p.m.

Vancouver:	(604) 273-4453
Toronto:	(416) 624-5944
Montreal:	(514) 332-6371

OPTIONS and SUPPLIES

KX-P19	RS-232C/Current Loop Serial Interface Board
KX-P36	Auto Cut Sheet Feeder (Single bin)
KX-P43	32K Buffer Chip
KX-P145	Ribbon Cassette (black)

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